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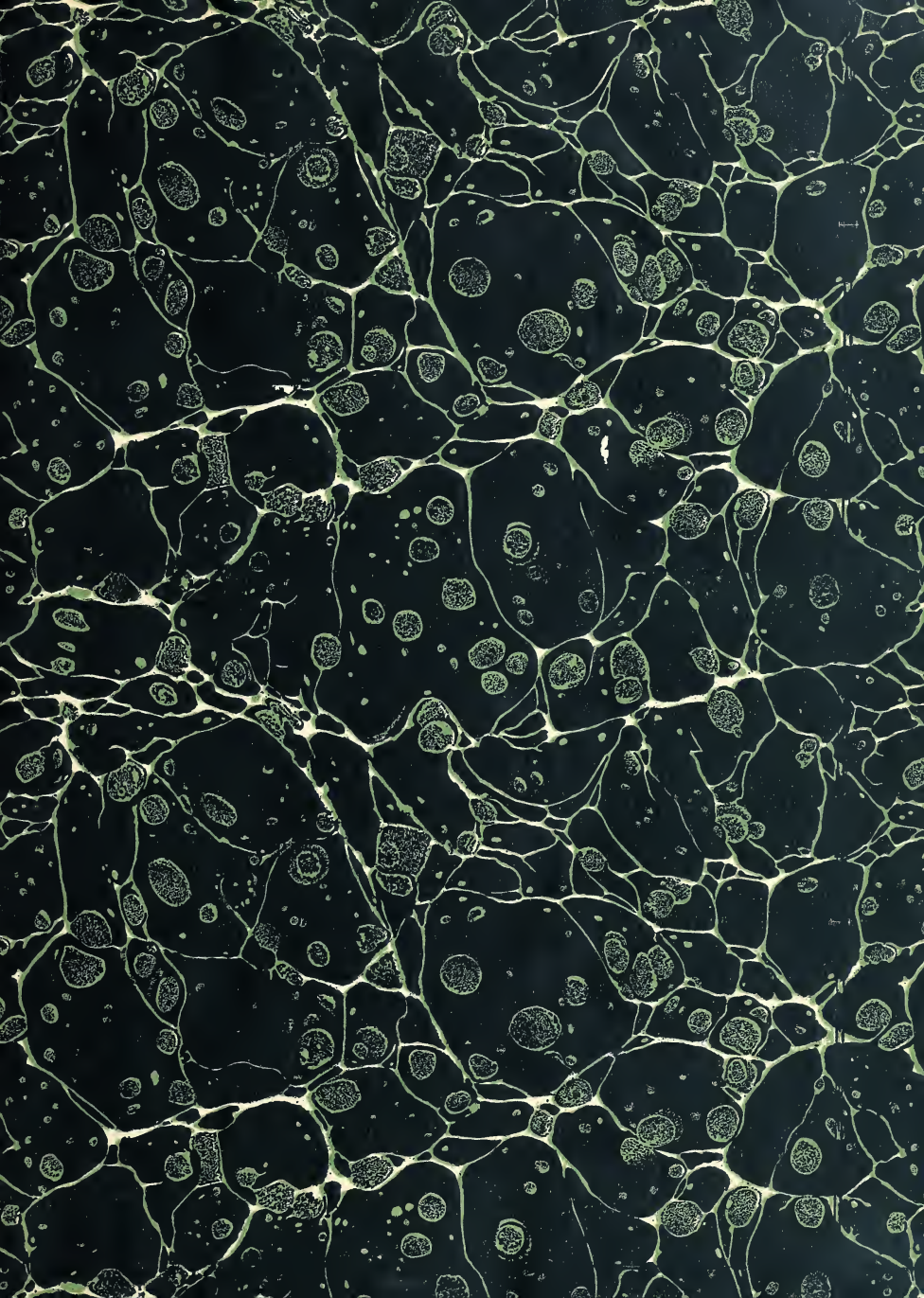


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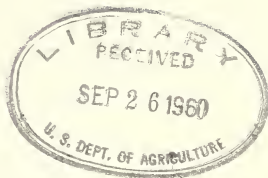












BLISTER-RUST WORK

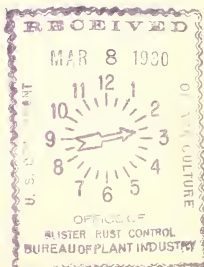
IN THE FAR WEST

January 1 to December 31, 1929.

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Spokane Branch  
Office of Blister-Rust Control  
618 Realty Building  
Spokane, Washington









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Map No. 19

Drawer No. 21

Maps part of 1929 Western Annual Report

Clearwater National Forest  
 Clearwater Timber Protective Association  
 Potlatch " " "  
 Commercial W. P. Area of the Inland  
 Empire  
 Calif. Ribes Eradication area Flumas  
 Nat'l. Forest (Mt. Diablo Meridian)  
 Savenac Nursery

PACIFIC OCEAN

OREGON

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# KNOWN SPREAD OF WHITE-PINE BLISTER RUST IN THE WEST

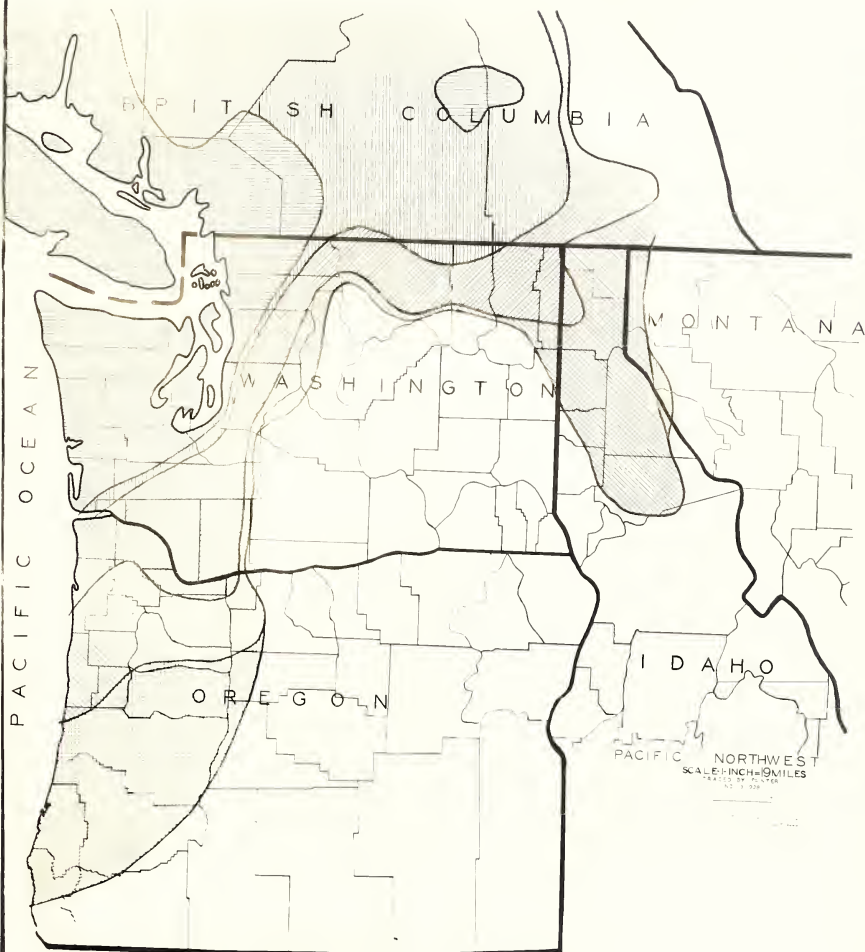
KNOWN LIMIT OF INFECTION IN 1922

KNOWN LIMIT OF INFECTION IN 1927

KNOWN LIMIT OF INFECTION IN 1923

KNOWN LIMIT OF INFECTION IN 1928

KNOWN LIMIT OF INFECTION IN 1929









## BLISTER RUST WORK IN THE FAR WEST

January 1 to December 31, 1929.

\* \* \* \* \*

### INTRODUCTION

The year 1929 was important in the western blister-rust control work because of three outstanding developments. The first of these is the discovery of pine infection at several points in north Idaho, the second is the realization of the importance of stream-type eradication as an initial attack upon the disease, and the third is the undertaking of stream-type eradication on a cooperative basis with two of the most prominent timber protective associations of the Idaho white-pine type.

The discovery of pine infection centers in north Idaho occurred during the field season of 1929. Four such points were located, the details of these areas being given in the body of this report. Of importance, however, is the fact that these infection areas corroborated the evidence secured at Newman Lake, Washington, and showed a wide sweep of infection over the Idaho white-pine belt in 1923. To a limited extent this has been followed by local intensification of pine infection in 1926 and 1927. It is obvious, however, that further intensification has been steadily going on and that the first favorable season for rust dissemination in the future will see a dangerous extension of pine infection in north Idaho.

With the development of a program of initial stream-type eradication the general program of blister-rust control in north Idaho received an important impetus. The completion of stream-type eradication is of particular value for the initial reason that it represents a direct and sharp blow at the greatest point of infective power in the white-pine type and also that it constitutes a very definite and concrete objective toward which cooperative control can be most effectively directed for several years to come. This development permits a program which will be highly effective in combating the rust and at the same time gives a high degree of elasticity in undertaking the second phase of general control, Ribes eradication in the upland types.

During the spring of 1929 the Clearwater and Potlatch Timber Protective Associations stated their willingness to undertake stream-type eradication upon a cooperative basis. As the plan was finally matured, Federal financial cooperation was given to these two associations in the proportion of two dollars of Federal money to one dollar of private money. During the process of the negotiations with the associations a



[illegible]



Federal cooperative policy took form which will insist upon the following points in the cooperative work:

(1) That reproduction as well as mature timber stands should be protected.

(2) That the stream-type eradication work in any locality should proceed in an orderly fashion upon the basis of drainages and irrespective of local ownership. If the associations are to receive this degree of Federal assistance it is incumbent upon them to straighten out any difficulties which may arise due to mixed land ownership so that the duty of this Office will be only to apply the proper and necessary control measures over the entire areas selected. The effect of this degree of cooperation and of this policy has been that the private timber owners have subscribed their share of the money for the operation but have secured this money from the larger operators rather than from the holders of small parcels of land which may be interspersed through their holdings. And they have been willing to do this in order to receive and hold the high degree of Federal cooperation. The system has thus far been particularly successful in that it has prevented any breaking up of the actual field work according to highly recognized differences in land ownership. These two associations have signified their willingness to continue these cooperative relations in the future and in accordance with their recent request this office is now preparing a general working plan for blister-rust control in these two and in the Priest Lake Timber Protective Association.

The State of Idaho has been a party to this cooperative work by means of an appropriation made in the last legislature of \$10,000.00 for blister-rust control. These state funds have been expended as the state's prorated share as a land owner in each of the two associations concerned. The effect of this method of organization has been that the timber protective associations, rather than the state itself, appear directly as the cooperator.

The activities of the Western Branch of the Office of Blister-Rust Control for the calendar year 1929, the period covered by this report, were conducted from funds available for two Federal fiscal years as shown below:

From January 1, 1929 to June 30, 1929, the applicable appropriation was "39133.14, Salaries and Expenses, Bureau of Plant Industry, Blister-Rust Control, 1929" in the amount of \$233,500.00 (for the entire fiscal year 1929) allotted as follows:



Internal cooperative policy (continued)

[illegible]



Project	For the Period 7/1/28 to 6/30/29
A. Delaying spread of blister rust	
1. Eradication of cultivated black currants in Montana, Washington and California.....\$	7,930.86
2. Field surveys and inspection of nurseries in Oregon.....	700.00
3. Field surveys in northwestern states to determine location of dangerous centers of pine infection and to follow the natural advance and establishment of blister rust in the northern area.....	11,695.65
B. Development and application of local control	
1. National forests of northeastern Washington, Idaho and northwestern Montana.....	62,222.32
2. Local control on state and private lands, dollar for dollar cooperation between Federal Government and timber owners.....	4,200.00
3. Control reconnaissance in Idaho, Montana and northeastern Washington.....	21,000.00
4. Studies of local control and its costs in California.....	11,000.00
5. Control reconnaissance and Ribes survey, California sugar-pine areas.....	5,500.00
6. Studies of local control and recheck of previously eradicated areas, Oregon.....	4,000.00
C. Investigational work, Office of Forest Pathology.....	21,500.00
D. Experimental work on chemical eradication and studies on Ribes ecology.....	26,923.32
E. Educational work.....	5,945.85
F. Field supervision, maintenance of Spokane Office, Miscellaneous supplies.....	23,900.00
G. Miscellaneous	
General control.....	\$20,080.00
Plant Disease Survey.....	500.00
2% Department Reserve.....	4,268.00
1% Bureau Reserve.....	2,134.00
Total.....	26,982.00 \$233,500.00

From July 1, 1929 to December 31, 1929, the applicable appropriation was "30133.14, Salaries and Expenses, Bureau of Plant Industry,



Total		1,200,000.00
B. Miscellaneous supplies		10,000.00
T. Field supervision, maintenance of equipment, etc.		50,000.00
E. Educational work		20,000.00
D. Experimental work on chemical control and control on birds ecology		25,000.00
C. Investigational work, office of forest entomology		25,000.00
6. Studies of local control and its effect		15,000.00
5. Control measures and their effect		2,000.00
California		15,000.00
4. Studies of local control and its effect		15,000.00
3. Control measures in local control		25,000.00
Government and timber control		4,500.00
Dollar for dollar cooperation between Federal		1,500.00
2. Local control on state and private lands		20,000.00
1. National Forest of Northern California		20,000.00
Development and location of local control		1,500.00
A. Delaying action of insects		1,500.00
3. Field surveys in northwestern states in California		1,500.00
2. Field surveys and location of insects		1,500.00
1. Identification of insects and their control		1,500.00
Total		1,200,000.00

From July 1, 1929 to December 31, 1934, the following was  
 "California, California and Oregon, Bureau of Entomology and Plant Quarantine"



Blister-Rust Control, 1930" in the amount of \$238,195.00 (for the entire fiscal year 1930) allotted as follows:

Project		For the period 7/1/29 to 6/30/30
A. Delaying spread of blister rust		
1. Eradication of cultivated black currants in California.....		\$ 7,000.00
2. Field surveys in northwestern states to determine location of dangerous centers of pine infection and to follow the natural advance and establishment of blister rust in the northern area.....		8,725.00
B. Development and application of local control		
1. National forests of northeastern Washington, Idaho and northwestern Montana.....		37,162.00
2. Local control on state and private lands, two dollars for dollar cooperation between Federal Government and timber owners.....		40,000.00
3. Studies of local control and its costs in California.....		18,643.00
4. Control reconnaissance and Ribes survey, California sugar-pine areas.....		5,800.00
5. Studies of local control and recheck of previously eradicated areas, Oregon.....		8,000.00
C. Investigational work, Office of Forest Pathology.....		22,155.00
D. Experimental work on chemical eradication and studies on Ribes ecology.....		32,180.00
E. Educational work.....		6,785.00
F. Field supervision, maintenance of Spokane Office, Miscellaneous supplies.....		25,000.00
G. Miscellaneous		
General control.....	\$19,710.00	
Mycology.....	540.00	
2% Departmental Reserve.....	4,330.00	
1% Bureau Reserve.....	2,165.00	
		26,745.00
Total.....		\$238,195.00

The present organization of the Western Branch of the Office of Blister-Rust Control partakes largely of a close centralization in which the work is all organized under direct supervision of the Spokane Office. The majority of the project leaders are permanently headquartered in Spokane. This system is altered only in the case of the state leaders for Montana, Oregon and California, who are headquartered in those states, and in the case of certain project leaders, whose



Blister-First Control 1952 is the second of the series  
entire series (see 1951) of the series

#### Object

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work is necessarily centered in other places. Even though more and more work is organized locally in the various states, the general supervision to which the state leaders are subject will remain with the Western Branch Office at Spokane, Washington.

The following is the permanent western personnel which was employed during the period covered by this report:

### 1. Supervisory

- a. In charge of Western Branch Office, S. N. Wyckoff, Senior Pathologist.

### 2. Project Leaders

- a. Ribes Ecological Studies. W. A. Rockie, Assistant Pathologist, assisted by J. L. Bedwell, Assistant Pathologist.
- b. Experimental Ribes Eradication, Montana. \*C. C. Strong, Associate Forester, C. H. Johnson, Assistant Pathologist in immediate charge, assisted by D. W. Nelson, Junior Forester.
- c. Experimental Re-eradication, Idaho. \*C. C. Strong, Associate Forester, assisted by C. O. Peterson and H. F. Geil, Agents.
- d. Cooperative Local Control, Idaho. \*C. C. Strong, Associate Forester, assisted by B. A. Anderson, W. G. Guernsey and M. C. Riley, Junior Foresters; H. E. Crossely and G. M. Whiting, Agents.
- e. Field Studies in Methods and Equipment. \*C. C. Strong, Associate Forester, assisted by P. S. Simcoe, Junior Forester (transferred to Plant Quarantine 10/1/29), J. F. Breakey, B. A. Ganoung and H. E. Swanson (resigned 9/30/29), Agents.
- f. Educational Work, R. L. MacLeod, Agent, assisted by Kermit Miller, Agent.
- g. Studies on Spread of the Rust and Damage to Pine. H. N. Putnam, Associate Pathologist, assisted by E. L. Joy, Junior Forester, C. M. Chapman, R. E. Myers and F. F. Staat, Agents.

\*For purposes of coordination and standardization of the various eradication projects (b, c, d and e) in the Inland Empire white-pine belt, these were all placed under the supervision of C. C. Strong, Associate Forester.



work is necessarily centered in Great Britain, and more work is organized in the various fields, the principal offices are located in London and Manchester.

Western Branch Office at Spokane, Washington

vision to which the State Inspectors are assigned all cases in which it is desired to have the assistance of the Western Branch Office at Spokane, Washington.

The following is the summary of the information received from the above mentioned sources during the period covered by this report:

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1. In order to assist in the development of the program, the following information is requested:

1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 26

a. Ribes Ecological Unit. . . . .

immediate change, and the other, to the Association for the Advancement of the Negro, which is a branch of the American Negro College Fund, Inc. The latter is a branch of the American Negro College Fund, Inc. The latter is a branch of the American Negro College Fund, Inc.

~~SECRET~~

Agents:  
Riley, Junior Forester; W. J. Tinsley, Jr. - 1921  
Forester, assisted by E. A. Anderson, W. J. Tinsley, Jr. - 1922  
Cooperative Ice Co. Control, Denver, W. J. Tinsley, Jr. - 1923

[illegible]

1. General Information

U. S. Department of Health and Human Services, Washington, D. C. 20201

\*The purpose of conducting the research was to determine the relationship between the use of the white-olive leaf, these were all placed under the same conditions.



h. Experimental Chemical Eradication. H. R. Offord, Agent, assisted by R. P. d'Urbal, G. R. Van Atta and Mrs. I. E. Webber, Agents.

i. Miscellaneous. Assigned to various projects. W. F. Fainter, (resigned 6/10/29), D. R. Payne (resigned 2/28/29), Agents and F. B. Rowe, Junior Forester (resigned 3/11/29).

### 3. State Leaders

a. Montana, C. H. Johnson, Assistant Pathologist.

b. Oregon, L. N. Goodding, Associate Pathologist, assisted by Miss D. L. Anderson, Agent.

c. California, C. A. Root, Assistant Pathologist, assisted by project leaders W. V. Benedict, Assistant Forest Pathologist (Eradication) with his assistant D. E. Miller, Junior Forester; F. A. Patty, Junior Pathologist (Ribes Ecology); T. H. Harris, Junior Forester (Reconnaissance). Stenographic work performed by Miss M. J. Preitkis, Agent.

### 4. Clerical Work

Roy Calhoun, Junior Administrative Assistant, assisted by A. H. Glasgow, Agent.

Miss M. L. McWold, Senior Clerk and Temporary Special Disbursing Agent, assisted by Mrs. M. C. Dowdy, Clerk and Mrs. E. M. Jump, Junior Clerk.

Mrs. L. E. Klatt, Clerk-Stenographer.

Miss Catherine Ryan, Junior Clerk-Stenographer.

Miss E. K. Mellon, Junior Typist.

Miss A. M. Fellows, Under Clerk-Typist.



Experimental Chemical Division, U. S. Bureau of Mines, Washington, D. C.  
 Dr. E. E. Dyer, Jr., Van Ness and 17th St., N. W., Washington, D. C.  
 i. Miscellaneous. Assigned to various projects:  
 (reassigned 1/1/33), Dr. E. E. Dyer, Jr. (reassigned 1/1/33)  
 Dr. E. E. Dyer, Jr. (reassigned 1/1/33)

### 3. State Leaders

a. Montana, G. W. Johnson, Assistant, Helena, Montana.  
 b. Oregon, J. W. Goodwin, Assistant, Medford, Oregon.  
 D. I. Anderson, Agent.  
 c. California, G. A. Ford, Assistant, Berkeley, California.  
 Project leaders: E. E. Benedict, Assistant, Berkeley, California.  
 (reassigned 1/1/33) with his assistant G. A. Miller, Berkeley, California.  
 Dr. E. E. Dyer, Jr. (reassigned 1/1/33) (Misses Goodwin, Dyer, etc.)  
 Junior Forester (reassigned 1/1/33). (reassigned 1/1/33) (reassigned 1/1/33)  
 by Miss M. L. Pfeiffer, Agent.

### 4. Clerical Work

Mr. Calhoun, Junior Administrative Assistant, Berkeley, California.  
 Glasgow, Agent.  
 Miss L. D. Arnold, Senior Clerk, and Junior Clerk, Berkeley, California.  
 Agent, assisted by Mrs. E. E. Dyer, Berkeley, California.  
 Junior Clerk.  
 Mrs. E. E. Dyer, Clerk-Typewriter.  
 Miss Catherine Dyer, Junior Clerk-Typewriter.  
 Miss L. E. Mellon, Junior Clerk.  
 Miss L. E. Mellon, Junior Clerk-Typewriter.



BLISTER-RUST-CONTROL WORK IN MONTANA  
1929

Blister-rust-control work in Montana was carried on, as in the past, as a cooperative project between the Montana Department of Agriculture, Montana Forestry Department, School of Forestry, University of Montana, the Northern Montana Forestry Association, the Blackfoot Protective Association and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was made effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1927

Between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
MONTANA STATE DEPARTMENT OF AGRICULTURE - - - MONTANA STATE FORESTRY  
DEPARTMENT - - - THE SCHOOL OF FORESTRY, UNIVERSITY OF MONTANA - - -  
and the NORTHERN MONTANA FORESTRY ASSOCIATION

Cooperative Work in Controlling White Pine Blister Rust  
in  
MONTANA  
\* \* \* \*

Paragraph F-6 of the Memorandum of Understanding described above contains the following:

"For the fiscal year 1928, the Bureau of Plant Industry shall contribute in value approximately \$6,000, the Montana State Department of Agriculture approximately \$5,000, the Montana State Forestry Department approximately \$1,200, the School of Forestry, University of Montana, approximately \$300, and the Northern Montana Forestry Association shall contribute in value approximately \$1,000; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provision, it is mutually agreed that the Blackfoot Protective Association will be added to those agencies who are cooperating to secure the control of white-pine blister rust in Montana and that for the fiscal year ending June 30, 1930, there will be contributed in value by the Montana



1793  
BRIEF-STATE OF MD. vs. MARY

Blister-trust control was to become a part of the program in the past, as a cooperative project between the U.S. Forest Service, Montana Department of Agriculture, and the Montana Forestry Association and the Montana Protective Association and the Bureau of Plant Industry. The program of exterminating this pest was discontinued in 1937 and was held in the period from 1937 to 1938. The following is the summary of the results of the year. The following is the summary of the results of the year. The following is the summary of the results of the year.

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Cooperative Work in the Home

1907

Paragraph 1-2 of the Memorandum is being included in the report above contains the following:

[illegible][illegible]



State Department of Agriculture approximately \$4,000, by the Montana State Forestry Department approximately \$1,200, by the School of Forestry, University of Montana, approximately \$300, by the Northern Montana Forestry Association approximately \$1,000, by the Blackfoot Protective Association approximately \$500, and by the United States Department of Agriculture, Bureau of Plant Industry, through its Office of Blister Rust Control, approximately \$7,500 in connection with cooperative blister rust control work in Montana.

Date:

Signature:

9/12/29

(s) A. H. Stafford

Commissioner, Montana Department of Agriculture

11/8/29

(s) Rutledge Parker

State Forester, Montana Forestry Department

11/8/29

(s) Thos. C. Spaulding

Dean, School of Forestry, University of Montana

10/14/29

(s) A. E. Boorman

Secretary, Northern Montana Forestry Association

11/25/29

(s) Roscoe Haines

Secretary, Blackfoot Protective Association

(s) Wm. A. Taylor

Chief, Bureau of Plant Industry



[illegible]

: 21.5

[illegible]

05/05/02

State University, Raleigh, North Carolina

17/2/52

(a) Topic: U. S. Education

4/2/53

100-443887-100

06/25/05

SECRETARY OF DEFENSE (S)

55/57

(s) [redacted]  
[redacted]



## RIBES ERADICATION, SAVENAC NURSERY, HAUGAN, MONTANA

By

C. H. Johnson,  
Assistant Pathologist.

The preliminary details, such as location, purpose of project and description of area, were covered in the previous year's report. The organization, methods and accomplishments of the 1929 season are herewith presented.

### INTRODUCTION

To protect the Savenac Nursery from blister rust requires the removal of Ribes from 612.4 acres of stream type. During the 1928 season 476.8 acres of this total were hand pulled and chemically sprayed, leaving a balance of 135.6 acres unfinished. The uncompleted acreage, together with re-eradication over the 207.4 acres sprayed in 1928, was to constitute the 1929 program and result in the elimination of the original stand of Ribes within a one-mile protection zone.

Observations made prior to starting the 1929 field season revealed almost a complete kill of R. petiolare, but the action of the  $\text{NaClO}_3$  solution on R. inerme proved to be the reverse. Since R. inerme constituted 65 per cent of the Ribes population all efforts were concentrated on the removal of this species. On July 1st a crew of six men commenced hand pulling on Savenac Creek. The general plan was to first remove all Ribes from the areas sprayed the previous year. As the work progressed it became strikingly apparent that six men could not pull all the Ribes and the only alternative was a method of more rapid destruction such as chemical spraying, fire or a combination of both. As fire offered a possible solution two men commenced spraying the heavy concentrations of R. inerme on the St. Regis River, while the main crew continued hand pulling on Savenac Creek. While the Ribes were being removed from one and three-eighths miles of stream type along the Savenac Creek approximately forty acres of heavily concentrated clumps of R. inerme had been sprayed on the St. Regis and were ready to be fired. No thought was entertained of doing a thorough job of spraying. The sole object was to apply sufficient spray to create a good burn. Concentrated  $\text{NaClO}_3$  was used.

Six men each devoted one day's time to setting fires and keeping them under control. Following the fire the entire crew was available for a systematic re-eradication of that portion of the St. Regis drainage worked in 1928. Had hand pulling alone been resorted to it is estimated that the end of the season would have found us occupied in removing Ribes from the St. Regis drainage.







TABLE NO. 1.

COST ANALYSIS, STREAM TYPE ERADICATION, SAVENAC NURSERY,  
1928.

Method of Eradication	Total Acreage Eradicated	T i m e			Total Cost	Cost Per Acre
		Foreman- Days	Asst. Foreman- Days	Laborer- Days		
Hand eradication	269.4	57.55	117 1/4	419 7/8	\$3,640.46	\$13.513
Chemical eradication	207.4	115.10	57 3/4	609 3/4	6,031.77	29.082
Combined hand and chemical	476.8	172.65	175	1,029 5/8	9,672.23	20.285

TABLE NO. 2.

COST ANALYSIS, STREAM TYPE ERADICATION, SAVENAC NURSERY,  
1929.

Method of Eradication	Total Acreage Eradicated	Foreman- Days	Laborer- Days	Total Cost	Cost Per Acre
Hand pull- ing aided with chem- icals and burning	244.4	62	398.5	\$3,342.29	\$13.675

The figure \$13.513 in Table No. 1 represents the cost of hand eradicating on small tributary streams with Ribes density averaging light to medium.

The figure \$29.082 indicates the cost of chemical eradication on major drainages in medium and heavy Ribes density.

The amount of \$13.675 represents the cost per acre of eliminating medium to heavy concentrations of Ribes on major drainages by hand eradication following spraying and burning.



1950-1951, 1952-1953, 1954-1955, 1956-1957, 1958-1959, 1960-1961, 1962-1963, 1964-1965, 1966-1967, 1968-1969, 1970-1971, 1972-1973, 1974-1975, 1976-1977, 1978-1979, 1980-1981, 1982-1983, 1984-1985, 1986-1987, 1988-1989, 1990-1991, 1992-1993, 1994-1995, 1996-1997, 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013, 2014-2015, 2016-2017, 2018-2019, 2020-2021, 2022-2023, 2024-2025, 2026-2027, 2028-2029, 2030-2031, 2032-2033, 2034-2035, 2036-2037, 2038-2039, 2040-2041, 2042-2043, 2044-2045, 2046-2047, 2048-2049, 2050-2051, 2052-2053, 2054-2055, 2056-2057, 2058-2059, 2060-2061, 2062-2063, 2064-2065, 2066-2067, 2068-2069, 2070-2071, 2072-2073, 2074-2075, 2076-2077, 2078-2079, 2080-2081, 2082-2083, 2084-2085, 2086-2087, 2088-2089, 2090-2091, 2092-2093, 2094-2095, 2096-2097, 2098-2099, 2100-2101, 2102-2103, 2104-2105, 2106-2107, 2108-2109, 2110-2111, 2112-2113, 2114-2115, 2116-2117, 2118-2119, 2120-2121, 2122-2123, 2124-2125, 2126-2127, 2128-2129, 2130-2131, 2132-2133, 2134-2135, 2136-2137, 2138-2139, 2140-2141, 2142-2143, 2144-2145, 2146-2147, 2148-2149, 2150-2151, 2152-2153, 2154-2155, 2156-2157, 2158-2159, 2160-2161, 2162-2163, 2164-2165, 2166-2167, 2168-2169, 2170-2171, 2172-2173, 2174-2175, 2176-2177, 2178-2179, 2180-2181, 2182-2183, 2184-2185, 2186-2187, 2188-2189, 2190-2191, 2192-2193, 2194-2195, 2196-2197, 2198-2199, 2200-2201, 2202-2203, 2204-2205, 2206-2207, 2208-2209, 2210-2211, 2212-2213, 2214-2215, 2216-2217, 2218-2219, 2220-2221, 2222-2223, 2224-2225, 2226-2227, 2228-2229, 2230-2231, 2232-2233, 2234-2235, 2236-2237, 2238-2239, 2240-2241, 2242-2243, 2244-2245, 2246-2247, 2248-2249, 2250-2251, 2252-2253, 2254-2255, 2256-2257, 2258-2259, 2260-2261, 2262-2263, 2264-2265, 2266-2267, 2268-2269, 2270-2271, 2272-2273, 2274-2275, 2276-2277, 2278-2279, 2280-2281, 2282-2283, 2284-2285, 2286-2287, 2288-2289, 2290-2291, 2292-2293, 2294-2295, 2296-2297, 2298-2299, 2300-2301, 2302-2303, 2304-2305, 2306-2307, 2308-2309, 2310-2311, 2312-2313, 2314-2315, 2316-2317, 2318-2319, 2320-2321, 2322-2323, 2324-2325, 2326-2327, 2328-2329, 2330-2331, 2332-2333, 2334-2335, 2336-2337, 2338-2339, 2340-2341, 2342-2343, 2344-2345, 2346-2347, 2348-2349, 2350-2351, 2352-2353, 2354-2355, 2356-2357, 2358-2359, 2360-2361, 2362-2363, 2364-2365, 2366-2367, 2368-2369, 2370-2371, 2372-2373, 2374-2375, 2376-2377, 2378-2379, 2380-2381, 2382-2383, 2384-2385, 2386-2387, 2388-2389, 2390-2391, 2392-2393, 2394-2395, 2396-2397, 2398-2399, 2400-2401, 2402-2403, 2404-2405, 2406-2407, 2408-2409, 2410-2411, 2412-2413, 2414-2415, 2416-2417, 2418-2419, 2420-2421, 2422-2423, 2424-2425, 2426-2427, 2428-2429, 2430-2431, 2432-2433, 2434-2435, 2436-2437, 2438-2439, 2440-2441, 2442-2443, 2444-2445, 2446-2447, 2448-2449, 2450-2451, 2452-2453, 2454-2455, 2456-2457, 2458-2459, 2460-2461, 2462-2463, 2464-2465, 2466-2467, 2468-2469, 2470-2471, 2472-2473, 2474-2475, 2476-2477, 2478-2479, 2480-2481, 2482-2483, 2484-2485, 2486-2487, 2488-2489, 2490-2491, 2492-2493, 2494-2495, 2496-2497, 2498-2499, 2500-2501, 2502-2503, 2504-2505, 2506-2507, 2508-2509, 2510-2511, 2512-2513, 2514-2515, 2516-2517, 2518-2519, 2520-2521, 2522-2523, 2524-2525, 2526-2527, 2528-2529, 2530-2531, 2532-2533, 2534-2535, 2536-2537, 2538-2539, 2540-2541, 2542-2543, 2544-2545, 2546-2547, 2548-2549, 2550-2551, 2552-2553, 2554-2555, 2556-2557, 2558-2559, 2560-2561, 2562-2563, 2564-2565, 2566-2567, 2568-2569, 2570-2571, 2572-2573, 2574-2575, 2576-2577, 2578-2579, 2580-2581, 2582-2583, 2584-2585, 2586-2587, 2588-2589, 2590-2591, 2592-2593, 2594-2595, 2596-2597, 2598-2599, 2600-2601, 2602-2603, 2604-2605, 2606-2607, 2608-2609, 2610-2611, 2612-2613, 2614-2615, 2616-2617, 2618-2619, 2620-2621, 2622-2623, 2624-2625, 2626-2627, 2628-2629, 2630-2631, 2632-2633, 2634-2635, 2636-2637, 2638-2639, 2640-2641, 2642-2643, 2644-2645, 2646-2647, 2648-2649, 2650-2651, 2652-2653, 2654-2655, 2656-2657, 2658-2659, 2660-2661, 2662-2663, 2664-2665, 2666-2667, 2668-2669, 2670-2671, 2672-2673, 2674-2675, 2676-2677, 2678-2679, 2680-2681, 2682-2683, 2684-2685, 2686-2687, 2688-2689, 2690-2691, 2692-2693, 26

Method of Irradiation	Age of Irradiated	Former - Date	Former - Location	Former - Time	Former - Date	Former - Location	Former - Time
Hand	20.4	27.55	17.14	27.55	27.55	17.14	27.55
Chemical	20.4	17.14	27.55	27.55	27.55	17.14	27.55
Combed	20.4	17.14	27.55	27.55	27.55	17.14	27.55
Hand and Chemical	20.4	17.14	27.55	27.55	27.55	17.14	27.55

COAST ANALYSIS, ST. LOUIS, MISSOURI, MAY 1950

[illegible]

The figure illustrates the relationship between the number of species and the number of individuals in a community. The x-axis represents the number of individuals, and the y-axis represents the number of species. The curve shows that as the number of individuals increases, the number of species also increases, but at a decreasing rate, indicating a logarithmic relationship.

THE AMOUNT OF ALCOHOL CONSUMED BY THE INDIVIDUALS IN THE  
STUDY WAS DETERMINED BY THE NUMBER OF GLASSES OF WINE, BEER,  
OR LIQUOR CONSUMED PER DAY. THE AMOUNT OF ALCOHOL CONSUMED  
WAS CALCULATED BY THE NUMBER OF GLASSES OF WINE, BEER,  
OR LIQUOR CONSUMED PER DAY. THE AMOUNT OF ALCOHOL CONSUMED  
WAS CALCULATED BY THE NUMBER OF GLASSES OF WINE, BEER,  
OR LIQUOR CONSUMED PER DAY.



In 1928 four sample plots, each 1/3 acre in size and representing medium to heavy concentrations of R. petiolare and R. inerme, were laid out on Savenac Creek, Big Creek and St. Regis River. The average time figured per acre was 13 days. Figuring a cost of \$5.00 per day brings the cost to \$65.00 per acre.

The big reduction in cost, which amounted to \$13.675 per acre in 1929, is attributed entirely to burning.

TABLE NO. 3.

TIME ANALYSIS, STREAM TYPE ERADICATION, SAVENAC NURSERY,

1929.

Drainage	Acreage Hand-Pulled	Acreage Sprayed	Total Acreage	Number Man-Days each Drainage	Number Man-Days Per Acre Eradicated
Savenac Creek	93.3	0.5	93.8	117.5	1.25
St. Regis River	61.0	61.6	122.6	148.0	1.20
Big Creek	26.0		26.0	132.5	5.09
Dry Creek	2.0		2.0	.5	.25
Totals	182.3	62.1	244.4	398.5	1.63

The 1.63 man-days in the preceding table represents the time element involved in eradicating the Ribes from one acre of stream type.

The original stand of Ribes along the St. Regis River consisted of 99 per cent R. inerme and R. lacustre and 1 per cent R. petiolare. On Savenac Creek and Big Creek 65 per cent were R. inerme and R. lacustre and 35 per cent R. petiolare. The R. petiolare was disposed of on the last-named drainage in 1928 leaving only 65 per cent of the total Ribes population to be eradicated in 1929.







Many thousands of bushes were consumed by flames which could not have otherwise been destroyed under methods now in general use.

Operations for the season were concluded on Big Creek. A fan-shaped area at the mouth of Big Creek, and upon which the R. petiolare had been killed the previous year, was re-eradicated to eliminate the R. inerme. On Big Creek the R. inerme are found to occur in dense masses, not extensively, but sufficiently so to make hand eradication appear almost impractical.

The fire hazard was great and a matter to be considered. The district ranger was consulted as to the most efficient and practical method of clearing the area. After careful consideration fire was recommended. Permission was obtained from the District Office at Missoula to burn. Dry snags were felled, brush and logs piled, 1,500 feet of fire hose assembled, and a pump installed. The brush which generally accompanies Ribes was nearly all dead as a result of the previous year's spraying. A very severe burn resulted. In spots where heavy concentrations of Ribes occurred in the midst of heavy windfall the fires burned several days. With only slight preparation the entire area sprayed by the power sprayer the previous year was cleared of Ribes, windfall and brush.

#### RESULTS FROM BURNING

1. The original stand of Ribes, together with brush and debris, was economically removed.
2. Large quantities of seed lying near the earth surface and beneath the duff were destroyed.
3. The way was paved for more severe root competition. Grasses can and will be made to replace the Ribes and brush.



any, thousands of dollars were expended by the Government for the purpose of maintaining the health of the people.

Operations for the purpose of maintaining the health of the people were carried out in the following manner: The first step was to clean up the streets and remove the garbage. The second step was to disinfect the houses and the third step was to vaccinate the people.

The first measure was to clean up the streets and remove the garbage. The second measure was to disinfect the houses and the third measure was to vaccinate the people. The first measure was to clean up the streets and remove the garbage. The second measure was to disinfect the houses and the third measure was to vaccinate the people.

### THE RESULTS OF THE OPERATIONS

1. The first result of the operations was that the health of the people improved.
2. The second result of the operations was that the mortality rate decreased.
3. The third result of the operations was that the economy improved.



## EDUCATIONAL WORK, MONTANA - 1929

By

C. H. Johnson,  
Assistant Pathologist.

The educational work this year consisted principally of interviews with heads of protective associations, lumber companies and state organizations with the object of familiarizing them with the true blister-rust situation in the state and adjacent territory.

The names of those interviewed are as follows: T. C. Spaulding, Dean, School of Forestry, University of Montana; Rutledge Parker, State Forester; A. E. Boorman, Secretary, Northern Montana Forestry Association and Roscoe Haines, Secretary, Blackfoot Protective Association also Forester and Land Agent for the Anaconda Copper Mining Company at Bonner, Montana.

### RESULTS FROM INTERVIEWS

Rutledge Parker, State Forester for Montana, has pledged a sum of \$250.00 and the equivalent in labor to start control work on state lands. The state has no appropriation for blister-rust work and the amount made available not only signifies a growing spirit in favor of blister-rust control but also gives encouragement for a gradually enlarged program.

The white-pine holdings of private owners are small and scattered in the state. The Anaconda Copper Mining Company owns approximately ten sections of white pine in northwestern Montana which were first discovered in 1928. The timber is considered more or less isolated at present but Mr. Haines, Forester for that company, remarked that they would not stand by and look on when a program was started in that region.

In March a talk on blister rust was given before the University of Montana Forestry Club. This talk was supplemented with lantern slides showing every phase of our work in the West. Blister-rust material showing the various stages of the rust on pine and Ribes was distributed among park rangers in Glacier National Park.



EDUCATIONAL WORK, MONTANA

G. A. Thompson,  
Assistant Secretary

The educational work this year consisted of interviews with heads of local live stock associations and state organizations with the object of determining the true blister-rust situation in the state and its effect on the industry.

The names of those interviewed are as follows:

Spaulding, head, Council of Forestry, Livingston; Rutledge Parker, head, State Forestry, Helena; Montana Forestry Association and National Forestry Protective Association also foresters of the state; Copper Mining Company of Montana, Butte.

EDUCATIONAL WORK, MONTANA

Rutledge Parker, State Forester for Montana, the highest sum of \$250.00 and the equivalent in honor of State Forester was given to him. The state has no department for blister-rust work and the amount made available for this purpose is very small in favor of blister-rust control but the State and Department have gradually enlarged program.

The white-pine blight of 1923-24 was a serious pest scattered in the state. The blight is now a serious pest approximately 100 sections of white pine in the Montana region were destroyed in 1923. The blight is now a serious pest isolated at present but Mr. Parker, Assistant Forester, remarked that they would not stand up to a serious pest started in that region.

In March a trip on blister-rust was made to the University of Montana Forestry Office. The trip was made with the aim of showing every phase of the disease in the state. Blister-rust material showing the various stages of the disease on white pine was distributed among the various live stock associations.



RESULTS OF CHECKING ERADICATION AT SAVENAC  
NURSERY, HAUGAN, MONTANA

by  
E. N. Putnam  
Associate Pathologist

In 1929 at Savenac Nursery, there were approximately 6 million Pinus monticola and 1 million P. strobus plants. In the fall of 1929 approximately  $1\frac{1}{2}$  million P. monticola and  $\frac{1}{2}$  million P. strobus trees were shipped to various points in District 1. Infection on R. petiolare was found 9 miles air line northwest of the nursery. It would be very difficult in District 1 to find an area for a nursery in which a greater volume of Ribes growth occurs within a radius of one mile. Because of the great profusion of Ribes growth it is extremely necessary to adequately protect this nursery from blister rust by the entire removal of Ribes within infecting distances as soon as possible.

In 1928 first attempts were made at Ribes eradication for a distance of one mile in all directions from the nursery. In 1929 portions of the area were re-eradicated by a small crew.

Tabel No. 1 shows the results of checking.

TABLE NO. 1

RESULTS OF CHECKING ERADICATION WORK AT SAVENAC  
NURSERY, HAUGAN, MONTANA, 1929

Year Erad- icated	Stream Checked	Number		Ribes Feet Live Stem Left Per Acre			Total
		Plots	Mil- acres	R. petiolare	R. inerm	R. lacustre	
1923	Dry Creek	53	1,156	409	4,023	63	4,495
1923	Timber Creek	5	234	0	32	0	32
1928	Total	58	1,390	340	3,351	53	3,744

1928 & 1929	St. Regis River	31	4,252	6	1,246	8	1,260
1928 & 1929	Savenac Creek	26	2,208	100	302	14	416
1928 & 1929	Big Creek	4	696	3	112	0	115
1928 & 1929	Total	61	7,156	34	845	9	888
Grand Total		119	8,546	84	1,252	16	1,352







Since Dry and Timber creeks were not re-eradicated in 1929, it follows that the figure 3,744 represents the average feet of live stem per acre on these creeks now, and that the figure 1,352 represents the average feet of live stem per acre left at the present time over the entire area eradicated at Savenac Nursery.

It will be observed that R. inerme represents the most difficult eradication problem constituting nearly 93% of the Ribes live stem left.

A high per cent of the Ribes growth found in 1929 on Dry Creek which was eradicated in 1928 consisted of sprouts from bushes under water when sprayed in 1928, and seedlings.

Using Dry and Timber creeks as representative of conditions after the 1928 eradication, it is apparent that the 1929 work brought about a material reduction in feet of live stem per acre. But the fact remains that in no sense can Savenac Nursery be considered as protected from blister rust. To protect it adequately requires as near a 100% eradication as is humanly possible, and a yearly going over to keep it in a sanitary condition.

Yearly scouting for blister rust should be carried on. In 1930 the enormous numbers of cankers of 1927 origin will begin to produce aecia, and we can expect a heavy and widespread distribution of the rust on Ribes. Weather records at Savenac Nursery during the fire season of 1929 show a relative humidity per cent higher than the normal for the region. This may be due to the large amount of irrigation carried on at the nursery. Since this is so and since apparently a high relative humidity offers favorable conditions for rust development it is evident that the danger from blister rust is greater at the nursery than in the surrounding region. Ribes conditions are still so highly favorable for rust development at Hagan that we can expect next year to find rust on Ribes within the immediate vicinity of the nursery. To prevent the pines in the nursery from becoming infected from such sources it is highly important that in 1930 a large scale eradication job be undertaken as early as possible in order to destroy Ribes growth before the time of telial development.



Since the first census was taken in 1923, it follows that the census of 1923 was the first of five taken per year on these islands. The census of 1923 represents the average level of five years and the census of 1923 time over the entire area was taken as a whole.

It will be observed that in 1923, the census of 1923 was the first of five taken per year on these islands. The census of 1923 represents the average level of five years and the census of 1923 time over the entire area was taken as a whole.

A high per cent of the census of 1923 was taken on these islands. The census of 1923 represents the average level of five years and the census of 1923 time over the entire area was taken as a whole.

Using the census of 1923 as a basis, the census of 1923 was the first of five taken per year on these islands. The census of 1923 represents the average level of five years and the census of 1923 time over the entire area was taken as a whole.

Yearly census for these islands, showing the census of 1923 as a basis, the census of 1923 was the first of five taken per year on these islands. The census of 1923 represents the average level of five years and the census of 1923 time over the entire area was taken as a whole.



## PRE-ERADICATION ON GLACIER NATIONAL PARK, MONTANA

By

C. C. Strong,  
Associate Forester.

In accordance with the request made by the National Park Service officials a preliminary examination of areas on Glacier National Park where western white pine was known to exist was made by C. H. Johnson and myself during the period June 10 to 14, 1929. As a result of this survey the following report is submitted:

### A. Purpose.

1. To determine the feasibility and probable cost of protecting white pine areas on the Park against blister rust.
2. To secure such information regarding the conditions affecting Ribes eradication as would be necessary for planning the work should it be attempted.

### B. Areas Examined.

All areas on which white pine was known to exist in sufficient quantities were surveyed in a preliminary manner. The largest area surveyed was that extending roughly from Park Headquarters near Belton northward to Lake McDonald with a narrow belt extending along the west side of the lake and up Fish Creek about two miles except where broken by the 1936 burn. This area also extends southwest along the Middle Fork of the Flathead River with narrow belts of white pine extending about two miles up two tributaries, one of which flows into the Middle Fork in section 34, township 32 north, range 19 west, Montana Meridian and the other flowing into the North Fork of the Flathead about 30 chains west of its junction with the Middle Fork. This latter portion of the area is low in quality so far as white pine is concerned, a large part of which forms an understory for larch and lodgepole pine and the balance mature trees forming less than 10 per cent volume of a stand, principally cedar, along streams and flat areas adjacent to streams.

The only other area examined where white pine existed in sufficient amounts to warrant consideration was that centering at the junction of Mineral and McDonald Creeks in township 35 north, range 17 west, Montana Meridian. This area, comprising roughly 2,000 acres, supports the best stand of white pine found on the park. It is all a part of a mature timber stand and (perhaps 10 years ago) probably comprised 40 per cent of the timber present. However, about one-half of the white pine trees which were alive 10 years ago have been killed by Dendroctonus



PRELIMINARY REPORT ON THE WHITE PINE FOREST

By  
Associate Forester

In accordance with the request made by the Forest Service officials a preliminary examination of the white pine forest in the western part of the park was made during the period June 10 to 15, 1904. The following report is submitted:

A. Purpose.

1. To determine the feasibility and probable cost of protecting the pine areas on the park against fire.
2. To secure such information regarding the condition of the pine areas as would be necessary for planning the management of the same.

B. Areas Examined.

All areas on which white pine was known to exist in the park were surveyed in a preliminary manner. The largest area surveyed was that extending roughly from near McAdams to the westward to Lake McDonald with a narrow belt extending along the west side of the lake and up Fish Creek about two miles except where broken by the burn. This area also extends southward along the middle fork of the Flathead River with narrow belts of white pine extending about two miles up two tributaries, one of which flows into the middle fork section 34, township 33 north, range 12 west, Montana Meridian and the other flowing into the north fork of the Flathead about 30 miles west of its junction with the middle fork. This latter portion of the area is fairly good as far as white pine is concerned, a large part of which is an undisturbed forest and lodgepole pine and a large number of trees forming less than 10 per cent volume of a stand probably not over 100 years old and first areas adjacent to streams.

The only other area examined was that which was known to exist in the vicinity of the McAdams burn. This area was surveyed in a preliminary manner and was found to contain a large number of white pine trees, but the best stand of white pine found on the park was that on the west side of the lake and up Fish Creek about two miles except where broken by the burn. This area also extends southward along the middle fork of the Flathead River with narrow belts of white pine extending about two miles up two tributaries, one of which flows into the middle fork section 34, township 33 north, range 12 west, Montana Meridian and the other flowing into the north fork of the Flathead about 30 miles west of its junction with the middle fork. This latter portion of the area is fairly good as far as white pine is concerned, a large part of which is an undisturbed forest and lodgepole pine and a large number of trees forming less than 10 per cent volume of a stand probably not over 100 years old and first areas adjacent to streams.



monticolae, or white pine bark beetle, during the intervening years. The bark beetles are still at work as evidenced by the hundreds of trees scattered over the whole area which are in a dying condition.

A certain amount of scouting was done for the purpose of determining whether or not there were other important white pine areas but none were found. According to the best information secured the two main bodies described represent about all of the white pine area on which protection would be highly desirable to the Park Service.

#### C. Conditions Affecting Ribes Eradication.

On the area centering about Park Headquarters Ribes were found to exist in very definite locations. There is a narrow belt along the bottom of the north slope of the Belton Hills extending the entire distance to Lake McDonald which has four species of Ribes; namely, Ribes inerme, R. setosa, R. lacustre and R. viscosissimum. On the balance of the area R. lacustre only was found and then only in a narrow belt bordering the streams and swampy spots. Thus the main body of the area would need only to be scouted for wet and swampy spots where Ribes might exist leaving only the Ribes populated areas described above to be worked by regular eradication crews.

That portion of the area lying well up on Fern and Fish Creeks is being damaged quite heavily by the bark beetle.

The Mineral Creek area, although much rougher in topography and far less accessible, would not be difficult to protect due to the presence of only one Ribes species, R. lacustre. However, it is present in far greater numbers than on the Headquarters area but is almost entirely confined to the same sites, namely, along streams and on rocky outcrops, swampy areas and seepages. The same method of working would be followed.

#### D. Cost of First Eradication of Ribes.

The nearest estimate regarding cost of original Ribes eradication on the two areas, based on the brief survey made is that it would probably not exceed \$3,000.00. Roughly the cost would be about equally divided between the areas.

#### E. Recommendations.

On the basis of the information secured it would hardly seem advisable to attempt Ribes eradication for controlling possible future damage by the rust unless measures are taken within the next year to stop



scattered over the whole area which are in a high condition.

A certain amount of security is maintained by the fact that the bodies are not being taken out of the country. It is not known whether or not there were other bodies in the area. It is not known whether or not there were other bodies in the area. It is not known whether or not there were other bodies in the area.

2. Conditions affecting these relations.

On the area extending about 1000 ft. to the north of the  
to exist in very definite locations. There is a small pond at the  
bottom of the north slope of the hill. The hill is a small  
distance to Lake Michigan, which is about 1000 ft. from the  
Hills (name), E. of Chicago, E. of Chicago, E. of Chicago, E. of Chicago,  
of the area E. of Chicago, E. of Chicago, E. of Chicago, E. of Chicago,  
bordering the stream and among others. The area is a small pond  
would need only to be moved to the wet and water level. The area is  
exit leaving only the Hills and the area extended about 1000 ft.

[illegible]

1. Cost of First Production

The nearest solution regarding cost of material is to use the same material on the two areas, based on the price of the material. If the cost of the material not exceed \$1,000.00, the cost would be about equal to the cost of the material between the areas.

... ..

On the basis of the information received, it is recommended that the Bureau be kept advised of any further information received from the Bureau of the Army, Navy, or Air Force, and that the Bureau be kept advised of any further information received from the Bureau of the Army, Navy, or Air Force.







the present heavy losses due to the small number of operations against both the beetle and the rust is greatly reduced. It is also to be noted that the two operations might be simultaneously done more economically than as two separate operations at different times.

Of the two, the Mineral Creek area is probably more important because of being attacked by the rust in the past. In fact the presence of only R. fasciatus, the great distance from any other area and the fact that it is almost completely free of any mountain might result in the area being able to handle the heavy rust. On the other hand the history of the rust development in the west makes it impossible to forecast when and where it will appear. With the result that no area appears to be safe.



SCOUTING FOR BLISTER RUST, NORTHWESTERN MONTANA - 1929

By

C. H. Johnson,  
Assistant Pathologist.

Intensive scouting by scouts under the supervision of H. N. Putnam was conducted along the upper St. Regis River and tributaries from the vicinity of Savenac Nursery and westward to the Montana-Idaho boundary. One light infestation on R. petiolare was found approximately nine miles west of the Savenac Nursery.

TABLE NO. 1.

SCOUTING FOR BLISTER RUST, VICINITY SAVENAC NURSERY,  
AUGUST AND SEPTEMBER, 1929.

Locality	Number Inspected					No. In- fected	Pines	
	R. pet.	R. iner.	R. vis.	R. lac.	Total		Exam.	Infect.
Big Creek and tributaries	1,970	810		50	2,830	0	320	0
Silver Creek and Big Sandy Creek	5,840	580	720	370	7,510	0		
Dominion Creek	1,350	20		20	1,390	0	805	0
Rainy Creek	1,000	20		10	1,030	0	500	0
Dismore Creek	1,000	50			1,050	0	10	0
Honaker Creek *	350	40			390	0	25	0
Brimstone Creek*	700				700	0	15	0
Randolph Creek	4,450	200		40	4,690	1	170	0
Savenac Creek and tributaries	3,450	50		240	3,740	0	350	0
Twin Creek and tributaries	956	10		70	1,036	0	85	0
Dry Creek	50	50		15	115	0	0	0
Timber Creek		5			5	0	0	0
Deer Creek	1,240	25	30	350	1,645	0	685	0
Packer Creek and tributaries	850	20		10	880	0	11	0
St. Regis River	6,220	900		17	7,137	0	131	0
Total	29,426	2,780	750	1,192	34,148	1	3,107	0

\*On Honaker and Brimstone Creeks 850 R. triste inspected.



# STUDY OF THE FLORA OF THE MOUNTAIN REGION OF THE STATE OF TEXAS

C. S. Johnson,  
University of California, Berkeley

Extensive collecting by Johnson and his assistants was conducted along the mountain front in the vicinity of Lawrenceburg, and resulted in the following list of plants. One light infestation of *Quercus* was found. The plants were collected in the vicinity of the Lawrenceburg mine.

TABLE 1.

PLANTS COLLECTED BY C. S. JOHNSON, MOUNTAIN REGION, TEXAS, 1911.

Locality	Det.	Alt.	Fl.	Fr.	Stems	Leaves	Seeds	Other
Big Creek and tributaries	1,370	40	10	10	10	10	10	10
Silver Creek and Big Sandy Creek	1,340	40	10	10	10	10	10	10
Dominion Creek	1,330	40	10	10	10	10	10	10
Rainy Creek	1,300	40	10	10	10	10	10	10
Manure Creek	1,280	40	10	10	10	10	10	10
Horseshoe Creek*	1,250	40	10	10	10	10	10	10
Stimulone Creek	1,200	40	10	10	10	10	10	10
Randolph Creek	1,150	40	10	10	10	10	10	10
Sevens Creek	1,100	40	10	10	10	10	10	10
and tributaries	1,050	40	10	10	10	10	10	10
Twain Creek and tributaries	1,000	40	10	10	10	10	10	10
Big Creek	950	40	10	10	10	10	10	10
Timber Creek	900	40	10	10	10	10	10	10
Deer Creek	850	40	10	10	10	10	10	10
Packer Creek	800	40	10	10	10	10	10	10
and tributaries	750	40	10	10	10	10	10	10
St. Louis River	700	40	10	10	10	10	10	10
Total	12,430	40	10	10	10	10	10	10

\*On Horseshoe and Stimulone Creeks 20 *Q. laevis* were collected.



The scouting conducted by the writer on the Kootenai, Cabinet, Blackfoot, Flathead and Missoula National Forests was more extensive.

TABLE NO. 2.

SCOUTING FOR BLISTER RUST NORTHWESTERN MONTANA,  
SEPTEMBER, OCTOBER AND NOVEMBER, 1929.

Locality	Number Inspected				Total
	R. petiolare	R. inermis	R. lacustre	R. visco.	
Blackfoot River and tributaries	300		180		480
St. Regis River and tributaries	1,100	720			1,820
Bull River and tributaries		650			650
Kootenai River and tributaries	15	1,460			1,475
Yaak River and tributaries		1,320		80	1,400
Fisher River		650			650
Stillwater Lakes	40	860			900
Flathead River and tributaries	35	938	63		1,036
Swan River and tributaries	480		60		540
Bitter Root River and tributaries	540	600			1,140
Missoula River and tributaries	420	700			1,120
Totals	2,930	7,898	303	80	11,211







BLISTER-RUST-CONTROL WORK IN IDAHO  
1929

Blister-rust-control work in Idaho was carried on, as in the past, as a cooperative project between the Idaho State Department of Agriculture, University of Idaho, Idaho State Board of Forestry, Potlatch Timber Protective Association, Clearwater Timber Protective Association, Coeur d'Alene Timber Protective Association, Pend Oreille Timber Protective Association, Priest Lake Timber Protective Association and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was made effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1927

Between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the

IDAHO STATE DEPARTMENT OF AGRICULTURE - - - UNIVERSITY OF  
IDAHO - - - IDAHO STATE BOARD OF FORESTRY - - - POTLATCH TIMBER  
PROTECTIVE ASSOCIATION - - - CLEARWATER TIMBER PROTECTIVE  
ASSOCIATION - - - COEUR D'ALENE TIMBER PROTECTIVE ASSOCIATION  
- - - PEND OREILLE TIMBER PROTECTIVE ASSOCIATION - - -  
and the PRIEST LAKE TIMBER PROTECTIVE ASSOCIATION

Cooperative Work in Controlling White Pine Blister Rust in  
IDAHO

\* \* \*

Paragraph J-6, of the Memorandum of Understanding described above, contains the following:

"For the Fiscal Year 1928, the Bureau of Plant Industry shall contribute in value approximately \$78,000 to the support of this cooperative work, the Idaho State Department of Agriculture shall contribute in value approximately \$1,100, the University of Idaho approximately \$4,000, the Potlatch Timber Protective Association approximately \$3,800, the Clearwater Timber Protective Association approximately \$3,800, the Coeur d'Alene Timber Protective Association approximately \$3,800, the Pend Oreille Timber Protective Association approximately \$3,800, and the Priest Lake Timber Protective Association approximately \$4,340; thereafter the amount to be







contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provisions, it is mutually agreed that for the fiscal year ending June 30, 1930, there will be contributed in value by the Idaho State Department of Agriculture approximately \$2,000, by the University of Idaho approximately \$4,000, by the Potlatch Timber Protective Association approximately \$10,000, by the Clearwater Timber Protective Association approximately \$10,000, by the Coeur d'Alene Timber Protective Association approximately \$ 2,300, by the Pend Oreille Timber Protective Association approximately \$ 2,300, by the Priest Lake Timber Protective Association approximately \$ 2,300, and by the United States Department of Agriculture, Bureau of Plant Industry, through its Office of Blister Rust Control, approximately \$83,000 in connection with cooperative blister rust control work in Idaho.

Date:

Signature:

10/1/29

(s) John E. Welch  
Commissioner, Idaho State Department of Agriculture

10/7/29

(s) F. G. Miller  
University of Idaho

10/31/29

(s) Ben E. Bush  
State Forester, Idaho State Board of Forestry

11/12/29

(s) A. W. Laird  
President, Potlatch Timber Protective Association

11/20/29

(s) Theo Fohl  
Secy.-Treas. Clearwater Timber Protective Association

12/16/29

(s) C. O. Graue  
Secy., Coeur d'Alene Timber Protective Association

12/3/29

(s) T. L. Greer  
Secy., Pend Oreille Timber Protective Association

12/24/29

(s) J. S. Barron  
Secy., Priest Lake Timber Protective Association

1/6/30

(s) Wm. A. Taylor  
Chief, Bureau of Plant Industry



with cooperative timber sale control work in Idaho. Its Office of Blister Pest Control, approximately \$22,000 in 1934, and the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, approximately \$22,000 in 1934, are the only agencies in Idaho which have been authorized to make such surveys. The Idaho State Department of Agriculture, Bureau of Entomology and Plant Quarantine, approximately \$22,000 in 1934, and the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, approximately \$22,000 in 1934, are the only agencies in Idaho which have been authorized to make such surveys. The Idaho State Department of Agriculture, Bureau of Entomology and Plant Quarantine, approximately \$22,000 in 1934, and the United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, approximately \$22,000 in 1934, are the only agencies in Idaho which have been authorized to make such surveys.

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## RIBES ECOLOGY IN THE INLAND EMPIRE, 1929

by

W. A. Rockie  
Assistant Pathologist

### I. Definition

This project conducts research and experimental investigation into the relations of Ribes to their environment. It investigates why, how, when and where Ribes grow.

Its application to the control program is two-fold, first to furnish facts regarding Ribes which will aid in eradication, and second, to investigate the possibility of evolving a forest management plan which will prevent or retard the inception and growth of new Ribes stands.

### II. Methods

The methods and working plans have necessarily been evolved for each individual line of study. These are described under the various lines of work.

Several of these studies were made possible through the cooperation of the University of Idaho. The advice and suggestions of members of the faculty, together with the use of laboratory space and equipment, were very important factors contributing to the success of these research studies.

Investigations of the following studies are in progress:

- A. Controlled Plot Study of Ribes.
- B. Light-Moisture-Duff Study.
- C. Life Habits of Ribes.
- D. Ribes Seed Germination Tests.
- E. Leaf-Area Live-Stem Studies.
- F. Temperature-Moisture Investigations.
- G. Soil Acidity Investigations.

### III. Results

The results are listed under the reports of the respective individual studies, which are described in the succeeding pages.



# THE UNIVERSITY OF MICHIGAN LIBRARY

1954-1955

## I. Definition

This project consists of the establishment of a library of books to be used in the study of the history of the United States, and to be available to the public.

The collection to be formed is to be a library of books, and to be available to the public. It is to be a library of books, and to be available to the public.

## II. Methods

The methods and techniques used in the collection of books are described in the following sections. The methods and techniques used in the collection of books are described in the following sections.

Several of these methods were used in the collection of books. The methods and techniques used in the collection of books are described in the following sections.

## Investigation of the following sections and in the following sections

1. Collection of books
2. Collection of books
3. Collection of books
4. Collection of books
5. Collection of books
6. Collection of books
7. Collection of books
8. Collection of books

## III. Results

The results are listed under the heading of the following sections. The results are listed under the heading of the following sections.





W. 359 General view of a set of controlled plots during their preparation at Lakeview, Idaho. August 1927.



W. 852 Duplicate of W. 359 after slightly more than 2 years, showing the new vegetation which has come in on the area. Consists of *Salix*, *Rubus*, *Pteridium*, *Ribes*, *Epilobium*, *Cirsium*, *Aster*, *Cornus*, *Linnaea*, *Coptis*, *Pachystima*. The burned areas usually show only *Ribes*, *Epilobium*, Bull Thistle and *Aster* for several years following burning. November 1929.

These duplicate photographs show the vegetation changes during two growing seasons. Controlled Plot Study at Lakeview, Idaho.









W. 358 Shows heavy burn plot at time of preparation. Burning has just been completed. August 1927.



W. 853 Duplicate of W. 358 after slightly more than 2 years. Later picture shows scattered dead stalks of Aster and Bull Thistle. Very little other vegetation has come in on this heavy burn plot. November 1929.

Heavy burn plots have a different flora from the other types of plots. Flora chiefly plants having very light wind-blown seeds. Controlled Plot Study at Lakeview, Idaho.







## A. CONTROLLED PLOT STUDY OF RIBES

### I. Definition

Described on pages 27 and 28 of the 1928 Annual Report.

### II. Methods

Described on page 38 of the 1928 Annual Report.

### III. Results

The controlled plots initiated in 1927 are summarized as one group of studies, and those begun in 1928 as another group. These summaries present the major results from these studies.

Graph No. 1 (1927 Controlled Plots) shows the effects of different disturbances of the duff mantle on the germination and survival of volunteer Ribes. The pertinent points of this graph, which have not been stated in preceding annual reports, are as follows:

1. Although the check plots are almost all entirely without Ribes, the conditions controlling a few of these check plots have induced the inception of new Ribes in such numbers that the average number of Ribes for all check plots is made rather high. These few check plots have many Ribes from at least two known causes, first, due to one of our men carelessly crawling over some low-roofed plots and gouging into the duff with calked shoes and, second, due to gravity causing the duff to slip and break open on the sidehill plots. The result in both instances was to cause a sufficiently higher temperature at the base of the duff to cause Ribes to germinate.

2. The plots with top duff removed and with all duff removed have given results very much alike, with a living population at the end of 1929 of from 15,000 to 20,000 Ribes per acre.

3. The different degrees of burning are consistent with the resultant Ribes population, the lighter burns destroying a minimum of the stored seed. The heavy burns destroy almost all of the stored seed.

4. The burned plots show that germination is almost complete the first year, while the unburned plots have a heavy additional germination the second year.



*[Faint, illegible handwritten notes]*

2001/05/21



Graph No. 1

QUARTER PINE VISCOUSMACH ON CONTROLLED PLOT STUDIES INITIATED IN 1927

## LEAFHOP

Solid bar - Number of living ribes per acre  
 Outlined bar - Number of ribes per acre which  
 have died during that season.  
 If total bar length exceeds total bar length  
 of previous season, it indicates that the  
 number of new ribes per acre  
 during that season.

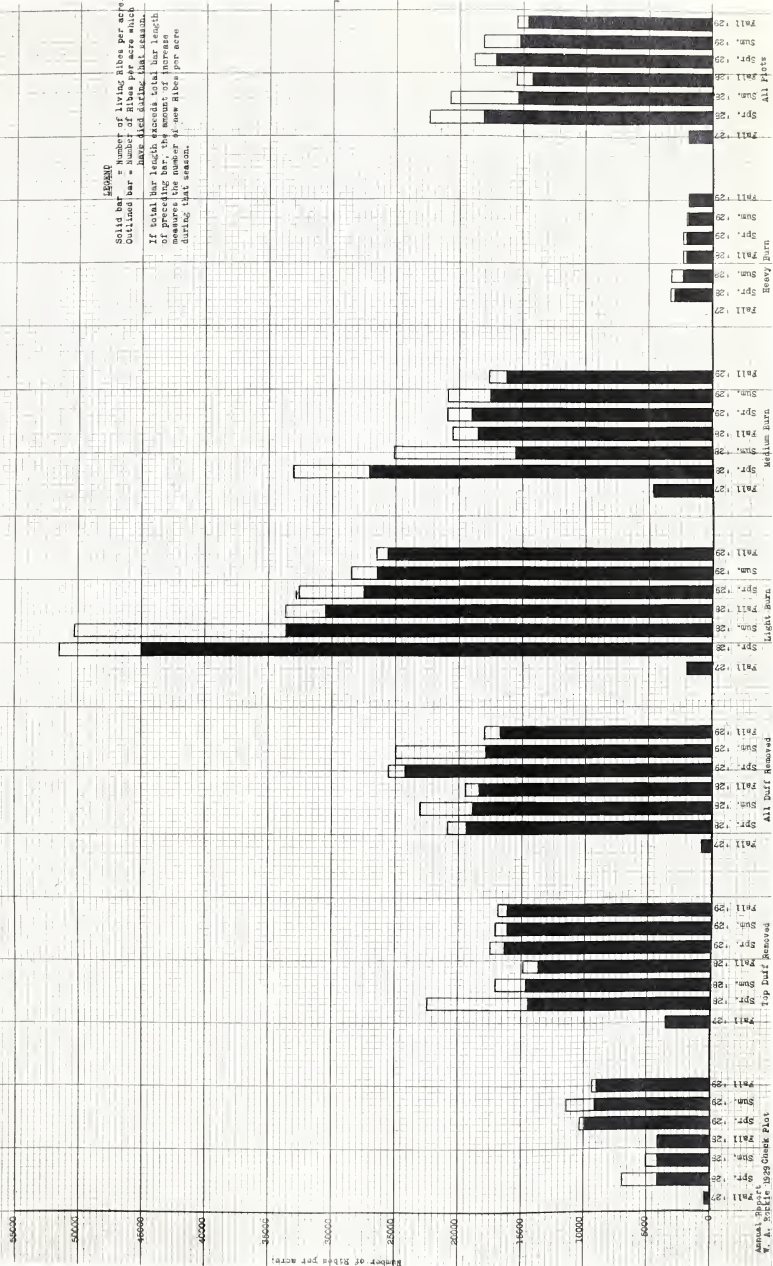








TABLE NO. 1

SEASONAL GERMINATION OF VOLUNTEER RIBES  
IN 1927 CONTROLLED PLOTS

	Fall 1927	1928		1929				Total
		Spring	Summer	Fall	Spring	Summer	Fall	
No. Ribes Per Acre	409.0	4,100.0	540.0	30.0	900.0	200.0	60.0	6,230.0
Per Cent of Total		65.8	8.7	.5	14.4	3.2	1.0	
Germination	6.4		75.0			18.6		100.0

TABLE NO. 2

SEASONAL CASUALTIES OF VOLUNTEER RIBES  
IN 1927 CONTROLLED PLOTS

	Fall 1927	1928			1929			Total
		Spring	Summer	Fall	Spring	Summer	Fall	
No. Ribes Per Acre	-	850.0	1,070.0	250.0	330.0	590.0	160.0	3,350.0
Per Cent of Total		26.2	32.9	7.7	10.1	18.1	5.0	
Casualties	-		66.8			33.2		100.0

5. The casualties of Ribes plants in the three initial seasons of growth, represent from 50 to 60 per cent of the total germination on these plots. The casualties are usually more than the average on areas of heavy Ribes concentration, and less than average on areas where Ribes are scattered.

6. Averaging all of the plots together, an average which tends to resemble the varied conditions which succeed a logging operation, a study of the Ribes is summarized in Tables No. 1 and 2.

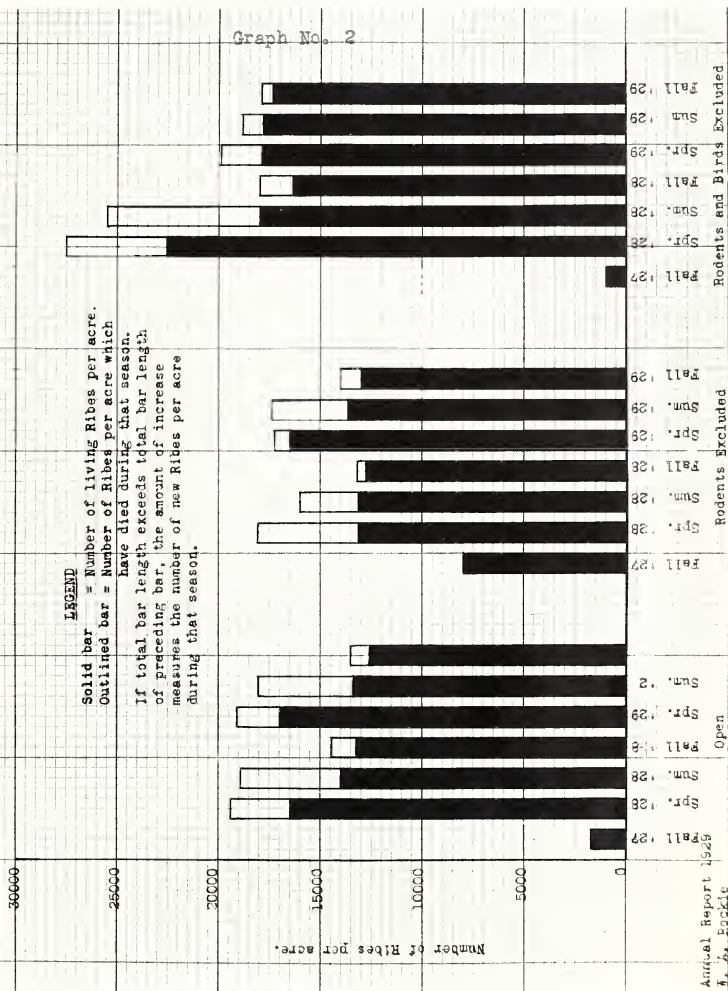
Table No. 1 shows that germination occurred chiefly during the first spring season, but that it does occur at all times during each growing season. It also shows that germination within any given year takes place naturally in the spring, with a much smaller number of plants appearing in the summer and fall.



Takes place naturally in the summer and appearing in the summer.



ROLE OF RODENTS AND BIRDS IN DISTRIBUTION  
OF RIBES VISCOSISSIMUM









7. The casualties of these newly incepted Ribes are shown in Table No. 2.

It shows that two-thirds of the casualties occurred during the first growing season. This resulted in spite of the fact that 1929, the second growing season, was considered one of the least favorable recent years for plant growth and survival.

8. It is shown by Tables No. 1 and 2 that out of an average of 6,230 volunteer Ribes per acre, 3,250 or 52.2% had died at the end of the 1929 field season.

Graph No. 2 shows a comparison of the Ribes germination in the three differently protected blocks. Block I is not protected from birds and rodents, Block II is fenced against rodents and Block III is fenced and roofed so that neither birds nor rodents have access to the block. These blocks have been thus protected during the fruiting periods of Ribes since the summer of 1927, when they were put under control.

The presence of fairly equal numbers of Ribes in the three differently protected areas, very definitely indicates that birds and rodents are a minor factor in the geographical spread of Ribes. The fact that Block III, from which both rodents and birds have been excluded, has more Ribes than either of the other blocks, may be explained in three ways.

A few local abnormally heavy concentrations of Ribes within units of this block would be sufficient to bring the average population above another average in an otherwise similar area. A glance at the maps showing the very local bunching of these Ribes is evidence that this may be the true explanation.

The Ribes averages of the covered blocks include several partial sets of controlled plots having very populous Ribes covers which are not offset by similar plots in the other two blocks. This may explain the difference.

Still another plausible explanation is that the changed temperature and moisture conditions within the covered blocks, may result in better germination conditions than those provided by nature.

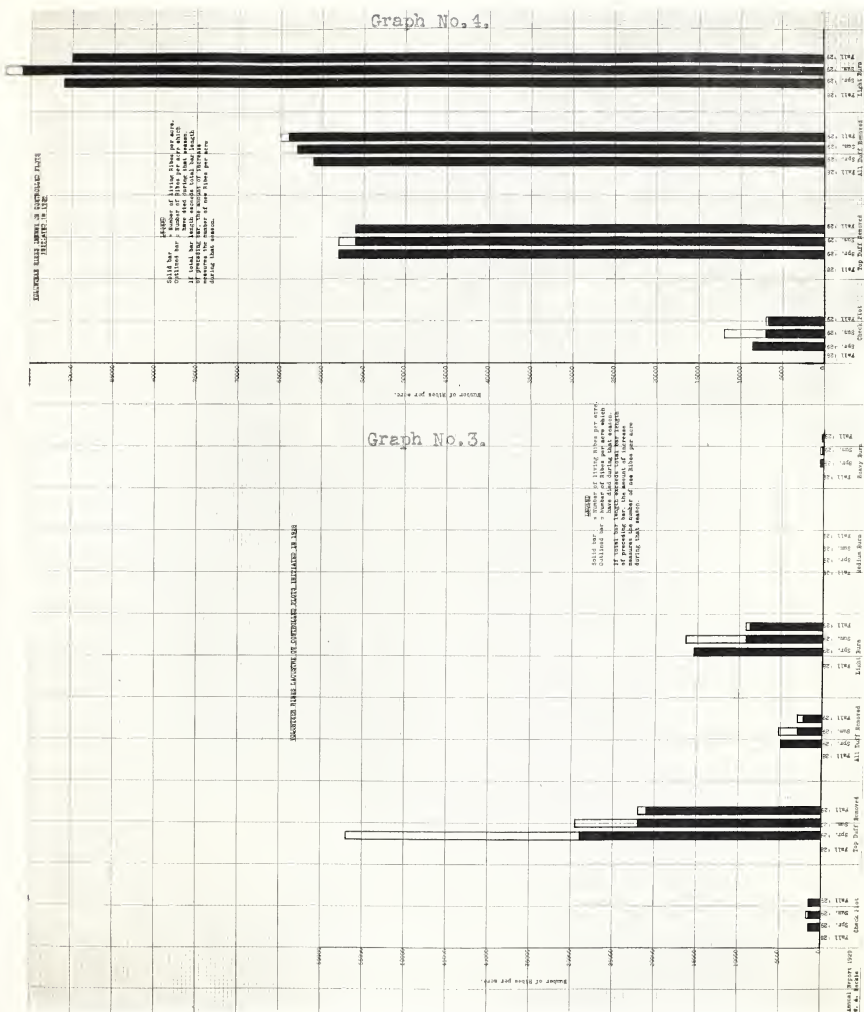
Any or all of these three causes may explain the heavier Ribes population in the covered block.







Graph No. 3.









Graph No. 3 shows the results of two controlled plot studies started in 1928. These areas resulted in the inception of seedlings of R. lacustre only.

The actual number of plots is so small that the very local occurrence of Ribes seeds in a given area is the striking feature. The results appear identical to the results from selected areas on which R. viscosissimum has appeared. These local irregularities are eliminated only by the averaging of the data of a large number of plots. One difference of these R. lacustre controlled plots from those of R. viscosissimum is that a dense canopy of mature timber still covers one of the two areas.

TABLE NO. 3

FIELD GERMINATION OF PLANTED RIBES FRUITS

Type of Ground Disturbance	No. of Fruits Planted	Results							
		No. That Germinated				Per Cent That Germinated			
		In 1928	Re-peat-ed 1929	New 1929	Total No. Fruits	In 1928	Re-peat-ed 1929	New 1929	Total No. Fruits
Unburned Plots									
a. Undisturbed Check Plot	208	2	-	1	3	.96	-	.48	1.44
b. Top Duff Removed	188	15	3	1	16	7.98	1.60	.53	8.51
c. All Duff Removed	116	14	-	1	15	12.07	-	.86	12.93
Total & Ave. on Unburned Plots	512	31	3	3	34	6.05	.59	.59	6.64
Burned Plots									
a. Light Burn	188	96	-	7	103	51.06	-	3.72	54.78
b. Medium Burn	48	33	3	1	34	68.75	6.67	2.08	70.83
c. Heavy Burn	168	80	1	6	86	47.62	.60	3.57	51.19
Total & Ave. on Burned Plots	404	209	4	14	223	51.73	.99	3.47	55.20
Grand Total & Ave.	916	240	7	17	257	26.20	.76	1.86	28.06







TABLE NO. 4

GERMINATION FROM FIELD PLANTINGS OF RIBES SEEDS

Type of Ground Disturbance	Number of Fruits Planted	Number of Ribes Seedlings		
		In 1928	In 1929	
			From Fruits Which Also Had Germinated 1928	From Fruits Dormant in 1928
Unburned Plots				
a. Undisturbed Check Plot	208	31	-	1
b. Top Duff Removed	188	62	1	6
c. All Duff Removed	116	19	-	1
Total on Unburned Plots	512	112	1	8
Burned Plots				
a. Light Burn	188	1,213	35	45
b. Medium Burn	48	551	37	21
c. Heavy Burn	168	530	83	31
Total on Burned Plots	404	2,294	155	97
Grand Total	916	2,406	156	105

Graph No. 4 showing the results of a controlled plot study on a potential R. inerme site, is directly comparable to the R. viscosissimum controlled plot studies. The similarity of results indicates that R. inerme reacts identically with R. viscosissimum.

The planting studies in connection with the controlled plots are summarized in Table No. 3. The results of the second year of germination are corroborative of the previous year's findings. The second year's germination of the planted fruits shows five times as many fruits germinating on the burned as on the unburned plots. The first year showed more than eight times as much. This second year's record includes only those fruits which did not germinate during the first year. Several fruits showed germination in both 1928 and 1929, but these are shown in a separate column of the same table.

Table No. 4 shows the number of seedlings which developed on the various types of plots.

The 1928 seedlings totaled more than 20 times as many on the burned as on the unburned plots, while the 1929 seedlings totaled 28 times as many on the burned as on the unburned plots.

The results obtained from these planted fruits definitely prove that dormancy without losing viability is a characteristic of R. viscosissimum.



# TABLE NO. 4

Comparison of the results of the two methods of determining the number of seeds in the fruit of the various types of pines.

Type of Pine	Number of seeds in fruit (by weighing)	Number of seeds in fruit (by counting)
Hardwood Pine	100	100
White Pine	100	100
Red Pine	100	100
Jack Pine	100	100
Pitch Pine	100	100
Shortleaf Pine	100	100
Longleaf Pine	100	100
Slash Pine	100	100
Table No. 4 shows the results of the two methods of determining the number of seeds in the fruit of the various types of pines.		

Graph No. 4 shows the results of the two methods of determining the number of seeds in the fruit of the various types of pines. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph.

The results of the two methods of determining the number of seeds in the fruit of the various types of pines are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph.

Table No. 4 shows the results of the two methods of determining the number of seeds in the fruit of the various types of pines. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph.

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The results of the two methods of determining the number of seeds in the fruit of the various types of pines are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph. The results of the two methods are compared in the graph.



## B. LIGHT-MOISTURE-DUFF STUDY

### I. Definition

Described on page 195 of the 1927 Annual Report.

### II. Methods

Described on pages 195, 196 and 197 of the 1927 Annual Report.

### III. Results

The results of the triple disturbance are as follows:

a. The three-fold results are best shown in Graph No. 5.

This graph shows that these three changes are of unequal importance and effect.

The third year of the experiment adds some additional apparent facts to the results described on page 49 of the 1928 Annual Report.

These additional effects of (1), the removal of the timber canopy, can be stated as follows:

1. Very little change in Ribes population.
2. Permanent establishment of the new Ribes stand.

The added effects of (2), trenching to cut all roots which enter the area, appear to indicate exactly the same results as during the preceding year.

The additional effects of (3), loosening of duff, can be stated as follows:

1. Where timber was removed, establishment of new Ribes appears permanent.
2. Where timber was not removed, all Ribes seedlings died before the end of 1929.

In summary, it appears that the removal of the timber canopy is the only one of the three changes which brings about the permanent establishment of a new Ribes stand. The loosening of the duff causes the inception of a new stand of *R. lacustre*, but only of a temporary character, since it seldom survives the first growing season. The trenching of the plot appears to be without effect.



I. Definition

Described on page 138 of the 1947 Annual Report.

II. Methods

Described on pages 138, 139 and 140 of the 1947 Annual Report.

III. Results

The results of the triple distance are as follows:

a. The three-fold results are best shown in Figure 1.

This graph shows that these three changes are of equal importance and effect.

The third year of the experiment with the triple distance experiment lacks the results described on page 140 of the 1947 Annual Report.

These additional effects of (1), the removal of the triple canopy, can be stated as follows:

1. Very little change in triple production.
2. Permanent establishment of the new triple canopy.

The added effects of (2), the removal of the triple canopy, enter the area, possibly to indicate exactly the same results during the preceding year.

The additional effects of (3), the removal of the triple canopy, can be stated as follows:

1. Where timber was removed, established in new triple canopy; permanent.
2. Where timber was not removed, all triple canopy died before the end of 1947.

In summary, it appears that the removal of the triple canopy is the only one of the three changes which brings about the permanent establishment of a new triple canopy. The removal of the triple canopy the inception of a new stand of *E. laurifolia*, but only in a permanent character, since it seldom survives the first winter season. The trenching of the plot appears to be without effect.



## Graph No. 5

## LIGHT-MOISTURE-DUFF STUDY

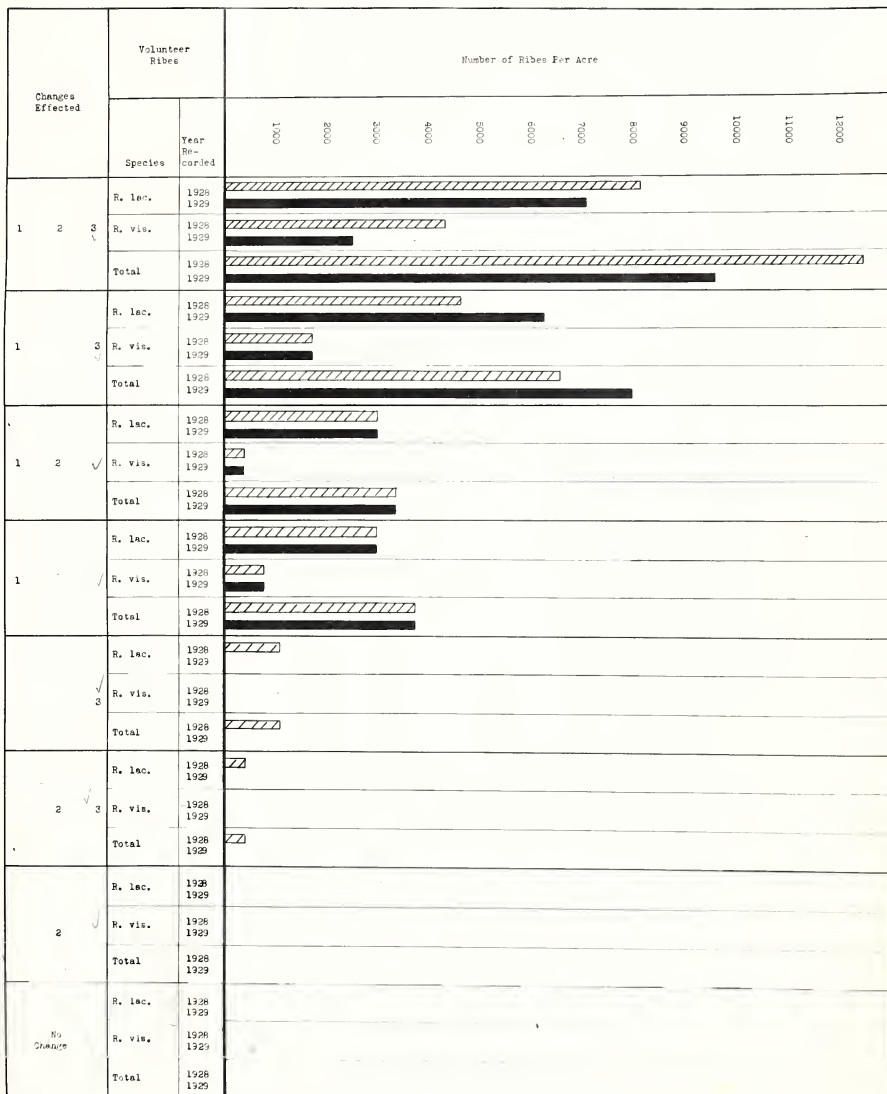








TABLE NO. 5

ROOT COMPETITION, 1929

Name of Plot	No. of Milacres		No. of Ribes			Ribes Per Acre		
	Trenched	Un-trenched	Trenched		Un-trenched	Trenched		Un-trenched
			Germ-in-ated	Sur-vived		Germ-in-ated	Sur-vived	
Lakeview #1	1	1	-	-	-	-	-	-
Lakeview #2	1	1	212	154	-	212,000	154,000	-
Lakeview #3	1	1	12	6	-	12,000	6,000	-
Lakeview #4	1	1	20	17	-	20,000	17,000	-
Meadow Cr. #1	3	3	-	-	-	-	-	-
Meadow Cr. #2	3	3	-	-	-	-	-	-
Meadow Cr. #3	1	1	59	52	-	59,000	52,000	-
Meadow Cr. #4	1	1	4	3	-	4,000	3,000	-
Meadow Cr. #5	1	1	-	-	-	-	-	-
Meadow Cr. #6	1	1	-	-	-	-	-	-
Meadow Cr. #7	1	1	-	-	-	-	-	-
Meadow Cr. #8	1	1	-	-	-	-	-	-
Meadow Cr. #9	1	1	-	-	-	-	-	-
Meadow Cr. #10	1	1	-	-	-	-	-	-
Meadow Cr. #11	1	1	-	-	-	-	-	-
Meadow Cr. #12	1	1	-	-	-	-	-	-
Meadow Cr. #13	1	1	-	-	-	-	-	-
Totals & Averages	21	21	307	232	-	14,619	11,048	-

b. The results of the single disturbance experiments (root competition) are as follows:

The numerical results are shown in Table No. 5.

Although the second year of these trenched plots showed practically no Ribes germination inside the trenched area, the third year shows many Ribes occurring on 5 of the 21 milacre plots. This germination developed in sufficient quantity on these few plots to be striking. On the other hand, the absence of new plant growth in general, and of Ribes in particular, from the remaining 16 plots, is even more striking. This latter condition indicates that some marked disturbance has occurred on the 5 plots now having Ribes. This is entirely possible since they are not protected by a fence of any kind. Cattle and deer are commonly seen in the immediate vicinities.







Until more than 5 out of 21 plots show a response to the elimination of root competition, it appears that root competition should not be considered as a dominant factor. Additional annual examinations of these experimental plots are necessary before a conclusive statement is possible.

### C. LIFE HABITS OF RIBES

#### I. Definition

Described on page 51 of the 1928 Annual Report.

#### II. Methods

Described on page 51 of the 1928 Annual Report.

#### III. Results

The 1928 fruits of R. lacustre and of R. viscosissimum were found still adhering by their leaf stems on all of the caged bushes which were still enclosed.

The clump of 212 Ribes seedlings, first described in the 1926 annual report, now numbers 19 Ribes plants.

General observations on the growth of Ribes on the controlled plots and other study areas now indicate that the average Ribes begins fruiting at a more advanced age than was previously thought. It is the exceptional bush which fruits in its third year. It is the exceptional stand which is fruiting commonly in its fifth year. In 1930, all of the Ribes on the experimental plots will be measured to determine the average size of these plants. Each Ribes bush is staked and its age is positively known, so this will yield definite information on Ribes up to 5 years of age.

With more individual observations, it has become increasingly evident that most of the fruits of the Ribes species of northern Idaho are removed from the parent bushes before reaching maturity. All observations point to their consumption by the smaller rodents, generally while in an unripe condition.

Fruits of all of the northern Idaho Ribes species were desired for the seed germination studies in the laboratory but scarcely any fruits could be found in a ripened condition. These same bushes were fruiting heavily two weeks previously.



Until more than 500 of 21 plots were examined in the  
elimination of root competition, it is not possible to  
not be considered as a constant factor. The results of  
of these experimental plots are necessary to be determined  
is possible.

## COLLEGE EXPERIMENT

### I. Definition

Described on page 51 of the 1938 Annual Report.

### II. Methods

Described on page 52 of the 1938 Annual Report.

### III. Results

The 1938 trials of the 1938 trials and of the 1938 trials  
found still showing by their leaf area or weight. The results of these  
were still enclosed.

The group of 21 plots described, listed below in the 1938  
annual report, now numbered 19 plots of 1938.

General observations on the results of these plots are  
plots and other trials are the results of the average of the trials  
fruiting at a more advanced age than was previously known. It is  
exceptional than which fruit in its first year. It is the average  
stand which is fruiting normally in its fifth year. It is the  
Rises on the experimental plots will be observed as a result of the  
size of these plants. Each Rises has been noted and the results of these  
known, so this will define information on these plots in the 1938  
age.

With more individual observations, it has become known that  
evident that most of the fruits of the vines are of a similar size and  
removed from the parent bushes before reaching maturity. All vines are  
point to their connection by the smaller roots, which are in the  
an upright condition.

Trials of all of the northern vines in the garden were carried  
for the seed germination trials in the laboratory and outdoors and  
fruits could be found in a ripened condition. The results of these  
fruiting heavily two weeks previously.



Additional data were taken on the phenology of *Ribes*. These observations were particularly relative to the leafing out, the blooming and the fruiting of the several species.

#### D. RIBES SEED GERMINATION NEAR HARVARD, IDAHO

#### I. Definition and II. Methods

Described under C. on page 56 of the 1928 Annual Report.

#### III. Results

Since 100 seeds were planted under each set of conditions, the number of seedlings shown in Table No. 6 represents the actual percentage of germination.

TABLE NO. 6

#### RIBES SEED GERMINATION FROM PLANTED SEEDS, HARVARD, IDAHO

Age of <i>Ribes</i> Seed	2" Sawdust Mantle			Bare Mineral Soil			1/4" Charcoal Mantle			Average of All Soil Mantles			
	R. lac.	R. iner.	R. vis.	R. lac.	R. iner.	R. vis.	R. lac.	R. iner.	R. vis.	R. lac.	R. iner.	R. vis.	All <i>Ribes</i>
1927 Seed													
Crop	0	4.0	0	36.0	85.0	7.0	47.0	67.0	12.0	27.7	52.0	6.3	28.7
1928 Seed													
Crop	0	3.0	0	29.0	49.0	7.0	39.0	57.0	11.0	22.7	36.3	6.0	21.3
Both Seed	0	3.5	0	32.5	67.0	7.0	43.0	62.0	11.5	25.2	44.2	6.2	25.2
Crops	1.2			35.5			38.8			25.2			

The result is three-fold. The effect of the soil mantle is striking. The sawdust mantle, whose effect approximates that of a duff mantle, has 1.2%, while the other soil surfaces are very much alike, with 35.5% and 38.8% respectively for the bare soil and the charcoal surfaces. The differences appear to be resultant from temperature differences more than from any other factor.







The comparative germination by species is even more striking, R. inerme leading with 44.2%. R. lacustre has 25.2' and R. viscosissimum only 6.2%.

The comparative germination by age of seed shows no conclusive difference, the year-old seed yielding 28.7% and the new seed 21.3%. The true seed germination was probably higher than these figures, since the count includes only the plants which grew to sufficient size to permit positive identification as Ribes.

#### E. LEAF-AREA LIVE-STEM STUDIES

##### I. Definition

Described on page 212 of the 1927 Annual Report.

##### II. Methods

Described on page 212 of the 1927 Annual Report.

##### III. Results

Circular scales for the measurement of leaves of R. viscosissimum, R. lacustre and R. inerme have been made in preceding years.

Sufficient leaves of R. petiolare were gathered and pressed in 1929 to make a similar scale for the measurement of the leaves of that species. These measurements are now in progress and by the end of the present winter a leaf scale for each of the common species of northern Idaho should be available.

#### F. TEMPERATURE-MOISTURE INVESTIGATIONS

##### I. Definition

To isolate and to measure the effects of the various site factors upon the germination and growth of the four common species of Ribes in white-pine stands.

##### II. Methods

This is primarily a study of forest soil temperatures, as they pertain to the germination and growth of Ribes. The changes caused by different types of logging were particularly investigated.







Thermocouples and galvanometer were the instruments used for measuring these temperatures.

The temperature measurements were taken at the point where duff and mineral soil meet. It had already been determined that most of the dormant Ribes seeds are located at that point in the soil section.

Records of preceding years indicated that certain general effects were the result of certain factors but these factors had not been sufficiently isolated for measurement.

### III. Results

Dense virgin stands of white pine were selected near Harvard, Idaho and near Headquarters, Idaho. Both of these areas were recorded preceding and following clear-cut logging to secure an absolute measurement of the canopy's insulation at several points.

The temperature at the point of contact between duff and mineral soil was taken.

1. Before the logging was initiated.
2. After the timber canopy was removed.
3. After the duff was loosened from its naturally compact condition.
4. After the undisturbed duff was lightly burned.
5. After the top duff was removed.
6. After all the duff was removed.

Not all of the six conditions were necessarily recorded at each selected spot.

Graphs No. 6 to 8 show the results of these investigations. Graph No. 6, which shows the records at Harvard, Idaho, also includes a record made at the same spot two months later than the record made in July. This later record shows that seasonal effects upon the temperatures beneath undisturbed duff are much less marked than upon the temperatures where the duff has been disturbed or changed.

This graph shows that in July the canopy (40-year white-pine stand) held the maximum temperature to  $13.2^{\circ}\text{C}.$ , while the removal of that canopy brought the temperature to  $19.7^{\circ}\text{C}.$  Therefore this canopy gives  $6.5^{\circ}\text{C}.$  of insulation to the base of the duff. The mere loosening of the duff at this same point raised the temperature an additional  $7^{\circ}\text{C}.$



Thermocouples and thermometers were used for measuring these temperatures.

The temperature measurements were made at 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000.

Records of preceding years indicate that the effects were the result of certain factors and these factors had not been sufficiently isolated for measurement.

### III. Results

During the virgin stand of white pine the temperature was recorded at 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 290, 300, 310, 320, 330, 340, 350, 360, 370, 380, 390, 400, 410, 420, 430, 440, 450, 460, 470, 480, 490, 500, 510, 520, 530, 540, 550, 560, 570, 580, 590, 600, 610, 620, 630, 640, 650, 660, 670, 680, 690, 700, 710, 720, 730, 740, 750, 760, 770, 780, 790, 800, 810, 820, 830, 840, 850, 860, 870, 880, 890, 900, 910, 920, 930, 940, 950, 960, 970, 980, 990, 1000.

The temperature at the point of maximum temperature was recorded.

1. Before the drift was initiated.
2. After the drift was initiated.
3. After the drift was initiated from the north.
4. After the drift was initiated from the south.
5. After the top drift was removed.
6. After all the drift was removed.

Not all of the six conditions were recorded.

Graphs 1, 2, 3, 4, 5, 6, 7, 8 show the results of the measurements. Graph 1, which shows the records of the virgin stand, is a record made at the same spot two years later than the virgin stand. This latter record shows that the temperature was much less than the virgin stand. Graph 2 shows the results of the measurements where the drift has been distributed as shown.

This graph shows that in 1911 the temperature was much less than in 1910. The maximum temperature was 10.0°C. in 1910 and 10.0°C. in 1911. The minimum temperature was 0.0°C. in 1910 and 0.0°C. in 1911. The average temperature was 5.0°C. in 1910 and 5.0°C. in 1911.



By lightly burning the undisturbed duff, it was found that the basal duff temperature was increased by  $18.5^{\circ}$  C., although scattered clouds caused intermittent sunshine from 10:45 a.m. until evening. The burning actually causes a much greater difference. The top duff was removed, and an increase of  $23.5^{\circ}$  C. was obtained, although scattered clouds interfered from 9 a.m. until 12:30 p.m. Intermittent cloudiness greatly lowered the maximum temperatures during the taking of some of these records at Harvard.

This graph of records beneath a 40-year stand shows less striking results than those obtained under the older stand near Headquarters, Idaho.

Graphs No. 7 and 8 show the temperatures on the opposite east and west slopes of a sharp ridge, beginning with the virgin mature stand and ending with the bare and burned slopes after clear-cut logging. This setting is shown in photographs W. 770 and W. 771 of this report.

The removal of the forest canopy caused the temperature to increase by  $10^{\circ}$  C. on the east slope and  $14^{\circ}$  C. on the west slope.

The removal of the top duff caused a further increase of  $30^{\circ}$  C. on the east slope and  $20^{\circ}$  C. on the west slope.

The removal of the basal duff caused a further increase of  $5^{\circ}$  C. on the east slope and of  $1^{\circ}$  C. on the west slope.

By lightly burning the undisturbed duff after the removal of the canopy an increase in temperature of  $55^{\circ}$  C. on the east slope and  $40^{\circ}$  C. on the west slope was obtained.

It is noted that the highest temperatures on the east slope occurred between 11 a.m. and 12:00 p.m. while the maxima on the west slope were from 1 to 4 p.m.

The Clearwater Timber Company has at Headquarters, Idaho, established a system of forest management controlling an area of several thousand acres. This partial cutting, on forestry principles, has been completed on some 1500 acres immediately adjoining the town. Portions of this area have been logged to a minimum diameter of 14" D.B.H. and other parts to a minimum of 17" D.B.H.







Graph No. 9 shows the temperatures in the densest, the average and the most open parts of the 14" cutting area, with the typical temperature beneath similar virgin stands of the vicinity for comparison. These are shown on the lower part of the graph with the duff undisturbed and on the upper part of the graph with duff which had been disturbed. The effect of duff disturbance is measured between the corresponding curves on the lower and upper parts of the graph.

Graph No. 10 shows the same data on the 17" cutting area, with the duff undisturbed.

These several graphs show that the soil temperatures, following clear-cut logging, reach maximum temperatures of from 25° to 55° C. on the unburned areas while the corresponding temperatures on the partial cutting areas are from 16° C. to 45° C. Except in the most open parts of these partial cutting areas, sustained temperatures exceeding 25° C. are very unusual.

The data thus far gathered show practically no Ribes seedlings starting in these partial cutting areas. There is a possibility that a practicable forest management plan which will, in itself, prevent the growth of Ribes, can be developed from these and additional data along similar lines.



Graph No. 9 shows in comparison in the average and the most lower rate of the 1st and 2nd curves. The curves are somewhat similar with the average of the 1st curve being lower. These are also on the lower part of the graph with the 2nd curve being higher and on the upper part of the graph with the 1st curve being lower. The effect of drift distance is measured between the curves. The curves on the lower and upper part of the graph.

Graph No. 10 shows the same data as the 1st and 2nd curves, with the drift undisturbed.

These several graphs show that the soil temperature, which is clear-cut logging, reach maximum temperature of from 50° to 60° on the undisturbed areas while the corresponding temperatures on the cutting areas are from 35° to 45°. These temperatures are very unusual, of these partial cutting areas, and the temperatures are very unusual.

The data time for which no data is available starting in these partial cutting areas. There is a possibility that a practical forest management plan which will, in itself, the growth of trees, can be developed from these and additional data along similar lines.



Graph No.6.

SOIL TEMPERATURES AT BASE OF DIRT IN MULTIPLE PANEL.  
 200000 - 100000 - 50000 - 25000 - 12500









EAST SLOPE RECORD:

Graph No. 7

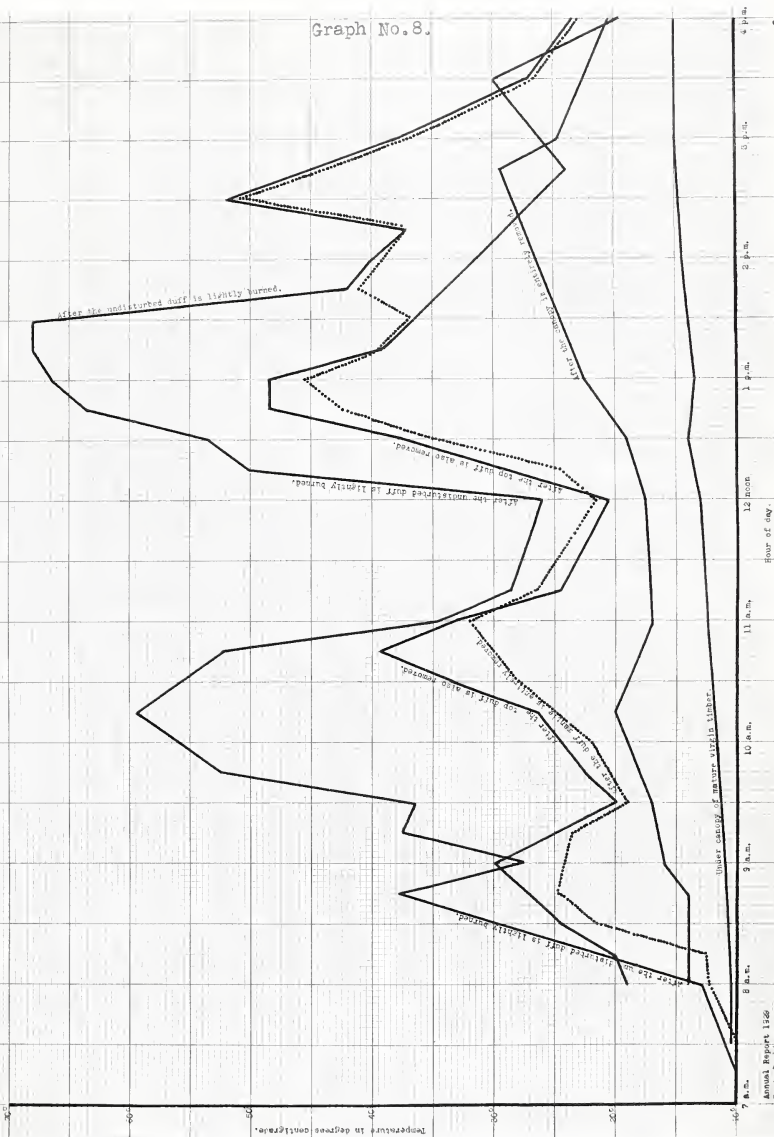








Graph No. 8.

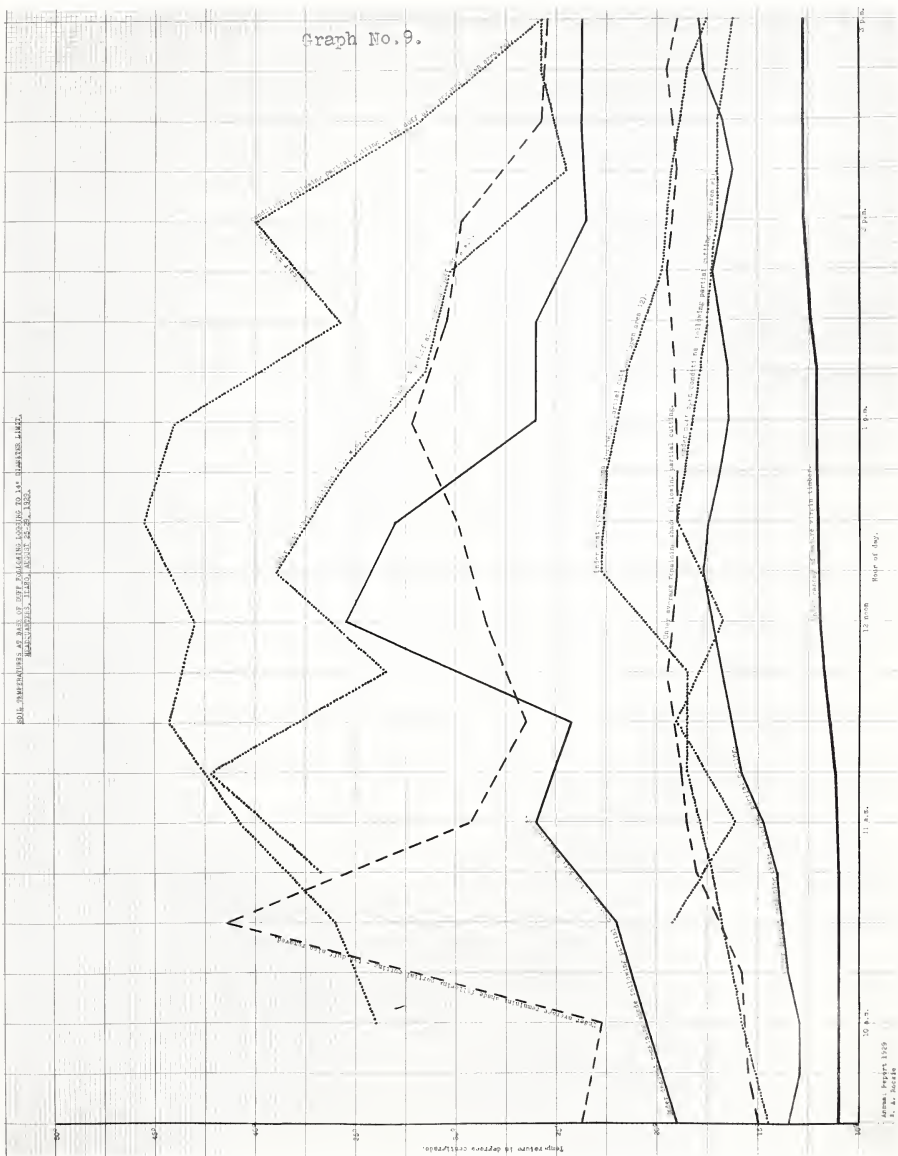








Graph No. 9.





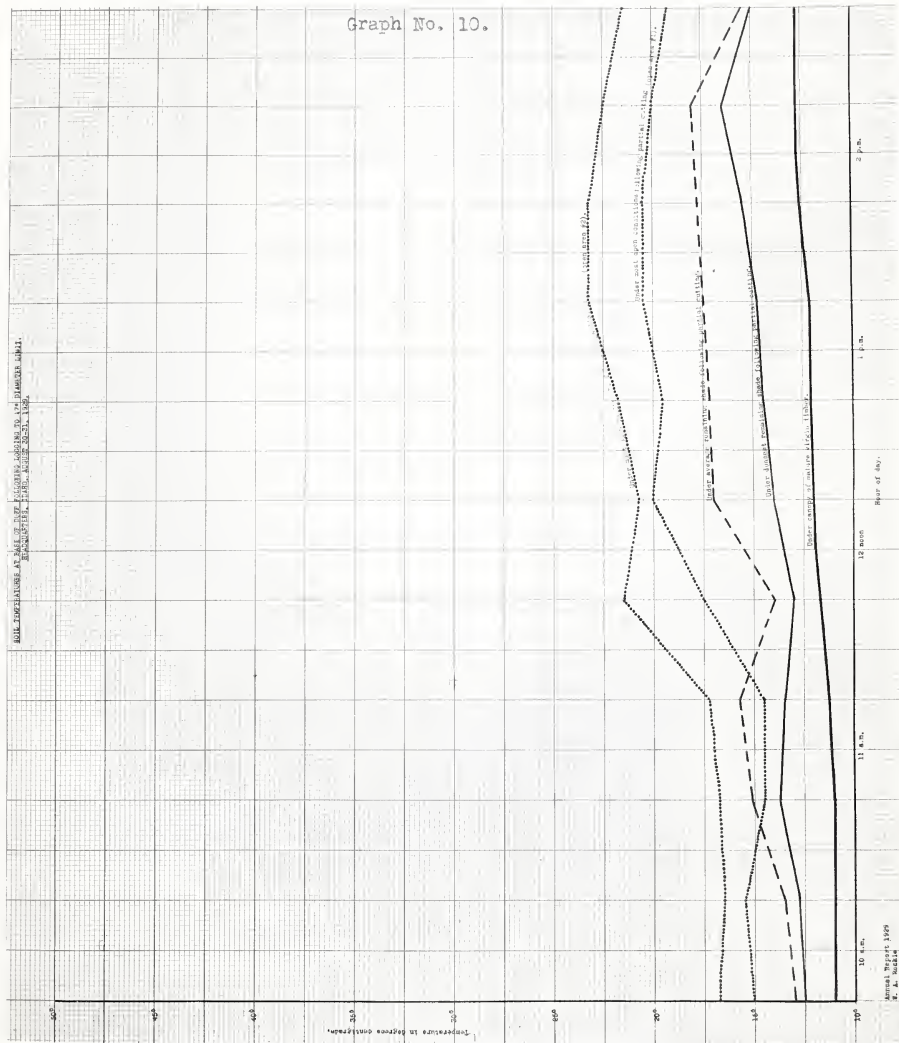




Graph	No.	10.
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HOW TEMPERATURE AT EACH OF FIVE FOLLOWING LOGGING TO 170 DIAMETER LINAL,  
STANDARDISERS. BT 190, AUGUST 30-31, 1969.

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED  
DATE 01-25-2008 BY 60322 UCBAW









## G. SOIL ACIDITY INVESTIGATIONS

### I. Definition

To measure the soil acidity in white-pine stands to determine any possible relations which may exist between the occurrence of Ribes and said soil acidity.

### II. Methods

The quinhydrone potentiometer (Youden) was used for making determinations in acidity.

The technique of making these determinations was outlined in entire detail by Dr. Bollen of the Agricultural Chemistry Department of the University of Idaho. These directions were followed to the letter. To still further check these determinations, 34 determinations were made coincidentally on the quinhydrone potentiometer and on the standard hydrogen ion apparatus. This work was done by Dr. Bollen, G. L. Luke and the writer,

Fifty-eight determinations of acidity were made in the Clearwater region. Six of these were on burned soils, the remainder on varied unburned soils.

The acidity of the burned soils appears as variable as that of the unburned soils. No consistent relation appears between fire and increased soil alkalinity.

The average acidity of 52 unburned soils was 5.92. The average of 6 burned soils was 6.36. The range of acidity in the unburned soils was from 5.33 to 6.69, while the range in the burned soils was from 5.67 to 6.77.

No soil, even immediately after a heavy burn, with much ash in the sample, was alkaline.

This study apparently yielded no results.



## SOIL ACIDITY INVESTIGATIONS

### I. Definition

To measure the soil acidity in which the degree of determining any possible relation which may exist between the occurrence of Ribes and soil acidity.

### II. Methods

The quinhydrone potentiometer (Loomis) was used for the determinations in acidity.

The technique of making these determinations was outlined in entire detail by Dr. Solten of the University of Iowa. These directions were followed to the letter. To still further check these determinations, determinations were made coincidentally on the quinhydrone potentiometer and on the standard hydrogen ion electrodes. This work was done by Dr. Solten, G. L. Luke and the writer.

Fifty-eight determinations of acidity were made in the Clearwater region. Six of these were on burned soils, the remainder on varied unburned soils.

The acidity of the burned soils appears as variable as that of the unburned soils. A consistent relation between the fire and increased soil alkalinity.

The average acidity of 52 unburned soils was 5.55. The average of 6 burned soils was 5.56. The range of acidity in the unburned soils was from 5.33 to 5.88, while in the burned soils was from 5.27 to 5.77.

No soil, even immediately after a heavy burn, was again the sample, was alkaline.

This study apparently verified the results.





W. 772 Without fire following logging.



W. 412 With fire following the logging. Inception of new Ribes in large numbers usually follows either procedure.









W. 770 East Slope.



W. 771 West Slope. These are taken at the point where the temperature records shown in Graphs 7 and 8 were taken. Nothing but cull trees were left standing after logging.









W. 765 Typical virgin stand before logging.



W. 763 Typical partial cutting area with 17<sup>th</sup> diameter limit.









W. 762 Showing local area with maximum proportion of the stand remaining.



W. 764 Showing local area with minimum proportion of the stand remaining.







REPORT ON CHECKING RIBES ERADICATION  
IN INLAND EMPIRE, 1929.

By

H. N. Putnam,  
Associate Pathologist.

INTRODUCTION

The year 1929 saw the first large scale application of stream-type eradication of Ribes in north Idaho in which chemicals were used. Correspondingly, it was necessary for the first time to institute checking of stream-type eradication. Also for the first time the checking was done by an independent project, which had for its chief aim the determination of the effectiveness of the Ribes eradication expressed in terms of pine protection, rather than, as heretofore, the efficiency of the Ribes eradication work itself.

The study of effectiveness of control is conducted along two general lines, one of which deals with the effect of Ribes eradication upon the Ribes population, and furnishes the field of application. The second is concerned with the effect of the surviving Ribes upon the action of the rust.

This report covers the work done under the first heading, namely, the effect of Ribes eradication upon the Ribes population.

PURPOSE

The purpose of checking is two-fold: to determine (1) how many and under what conditions Ribes are left after eradication, and (2) the effect of eradication upon the Ribes population, particularly with reference to the best time for re-eradication.

LOCATION OF WORK

The following areas were checked in 1929:

1. Areas eradicated in 1929 on the lands of the Clearwater Timber Protective Association, Idaho, on the North and South Forks of Reed's Creek, and on Alder Creek.

2. Areas eradicated in 1929 on the holdings of the Potlatch Timber Protective Association, Idaho, namely, East Fork of Potlatch Creek, Gold Creek, Deep Creek and Meadow Creek.







3. Areas on Lamb and Binarch Creeks, Kaniksu National Forest, Idaho, eradicated in 1926 and re-eradicated in 1928.

4. Savenac Nursery, Haugan, Montana, eradicated in 1928 and re-eradicated in 1929.

#### ORGANIZATION OF WORK

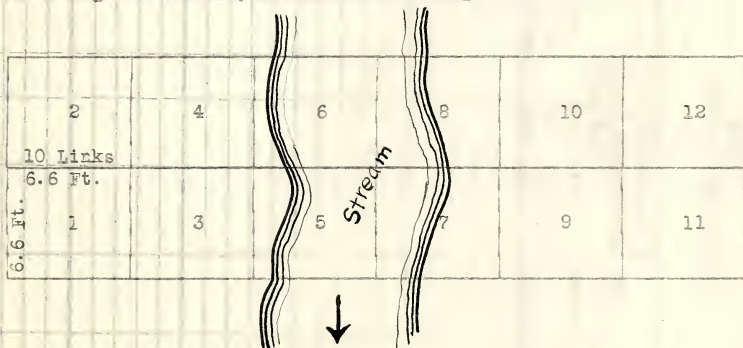
##### A. Methods.

Two general methods were used in the checking work: (1) by permanent plots, and (2) by temporary plots. These are discussed as follows:

1. Permanent Plots. Permanent plots were located at right angles to stream flow at 20-chain intervals on the main streams, by means of a stream traverse surveyed with compass and chain. Each plot was 13.2 feet or the width of two square milacres wide, and as long as the width of the stream type. This constituted a 1 per cent check of stream type.

Plots were established before eradication, and care was taken to mark them in such a manner that they would not be found by the eradication forces. The accompanying data sheet No. 15 shows the type of data taken. It may be noted that space is provided for five recordings on each plot.

The following diagram will show the procedure followed in numbering the Ribes by milacres containing them.









55

Plot No.

Foreman

## Method

Other Brush Density

[illegible][illegible]







For example, if a R. petiolare bush was found in mileacre No. 8, it would be called R. petiolare 8. If the next clump was in 11 it would be called R. petiolare 11. Small stakes on the center line were set at 10-link or 6.6-foot intervals and marked 1, 2, 3, 4, etc., reading from left to right. After eradication the plot was marked by larger permanent stakes. It is our intention to re-examine these plots at yearly intervals for several years.

2. Temporary Plots. After eradication streams not checked by the permanent-plot method were checked by temporary plots similar in size to the permanent plots but at 5-chain intervals. This constituted a 4 per cent check of stream type. The information was taken on form No. 40. On the back of this form a sketch map was made showing the stream checked, its tributaries and the location and number of check plots.

Information obtained on checking was turned over to the camp boss concerned with recommendations as to whether or not, in the opinion of the checker, the stream type was satisfactorily eradicated of Ribes.

#### B. Personnel Employed

The field force consisted of four members of the permanent personnel and four temporary assistants. These men devoted all or part of their time to this project.

### RESULTS OF WORK

The results of checking on areas eradicated in 1929 are shown following the report on the eradication area concerned. Results of checking on Lamb and Binarch Creeks and certain general results are shown here.

#### A. Statement of Checking Performed.

Table No. 1 constitutes a statement of all checking performed in 1929. In the temporary plot columns are included only the final check plots, and not first checking done on areas which had to be re-eradicated and again checked. In the grand total is shown only those permanent plots which were checked in 1929.



For example, if a temporary stream was found to be in  
 B, it would be called temporary B. If the next check was in  
 it would be called temporary B. Small streams on the central  
 were set at 10-15 ft or 2-3 foot intervals and marked 1, 2, 3, 4, etc.,  
 reading from left to right. After examination the plot was marked  
 larger permanent stream. It is the intention to re-examine these  
 plots at yearly intervals for several years.

2. Temporary plots. After examination streams not checked in the  
 permanent-plot method were covered by temporary plots similar in size  
 to the permanent plots but at 5-10 ft intervals. This consisted  
 4 per cent check of stream types. The information was taken on form  
 No. 40. On the back of this form a sketch was made showing the  
 stream checked, its tributaries and the location and number of check  
 plots.

Information obtained on checking was turned over to the com-  
 mands concerned with recommendations as to whether or not, in the opinion  
 of the checker, the stream type was satisfactorily represented.

#### D. Personnel involved

The field force consisted of four members of the permanent  
 personnel and four temporary assistants. These men devoted all or part  
 of their time to this project.

#### RESULTS OF WORK

The results of checking on areas indicated in the report  
 following the report on the eradication work concerned. Results of  
 checking on Lamp and Branch Creeks and certain general results are  
 shown here.

#### A. Statement of Checking Performed.

Table No. 1 constitutes a statement of all checking performed  
 in 1937. In the temporary plot columns are included only the first check  
 plots, and not first checking done on areas which had to a re-  
 eradicated and again checked. In the grand total is shown only those  
 permanent plots which were checked in 1937.



SAMPLE FORM

WF-BRC-#40, 7/15/29

TEMPORARY RIBES ERADICATION CHECK STRIPS 13.2 FEET WIDE

Project \_\_\_\_\_ Area \_\_\_\_\_  
T. \_\_\_\_\_ R. \_\_\_\_\_ Sec. \_\_\_\_\_ Checker \_\_\_\_\_ Date \_\_\_\_\_  
Stream Checked \_\_\_\_\_

[illegible]



地 區 名 稱

25/21/7, 25-218-7

[illegible]

१०३५०१३

• 200

## Statistical Methods

Serial	Station	Time	Remarks
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7	...	...	...
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9	...	...	...
10	...	...	...
11	...	...	...
12	...	...	...
13	...	...	...
14	...	...	...
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96	...	...	...
97	...	...	...
98	...	...	...
99	...	...	...
100	...	...	...



TABLE NO. 1.

## STATEMENT OF AMOUNT OF CHECKING DONE IN INLAND EMPIRE, 1929

A r e a s	Permanent Plots				Temporary Plots		Total Plots	
	Established		Checked		Plots	Mil- Acres		
	Plots	Mil- Acres	Plots	Mil- Acres			Plots	Acres
Savenac Nursery - Montana					119	8,546	119	8,546
Lamb and Pinarch Creeks, Keniksu National Forest, Idaho					137	14,148	137	14,148
Clearwater Timber Protective Ass'n.	129	3,984	80	2,732	1,809	32,728	1,889	35,460
Potlatch Timber Protective Ass'n.	47	1,140	31	868	2,302	62,908	2,333	63,776
Totals	176	5,124	111	3,600	4,367	118,330	4,478	121,930

The reasons for survival of *Ribes* found by the checkers on eradicated areas of the two timber protective associations have been classified as shown in Table No. 2. The information under "Chemical Eradication" concerns *R. petiolare* while under "Hand Eradication" *R. lacustre* only has been so classified.

TABLE NO. 2.

CLASSIFICATION OF REASONS FOR SURVIVAL OF *R. PETIOLARE* AND *R. LACUSTRE* FOLLOWING ERADICATION

Type of Information	Basis	Chemical Eradication			Basis	Hand Eradication	
		Total Miss	Insuf. Spray	Under Water When Sprayed		Total Miss	Incomplete Pull
Per cent of bushes	227 bushes	43%	41%	16%	2,444 bushes	90%	10%
Per cent of feet L.S.	4,119 F.L.S.	69%	23%	8%	37,487 F.L.S.	92%	8%
Ave. ft. L.S. per bush		29	10	9		16	12



STATUS OF LANDS IN THE STATE OF MONTANA

Area	Private Lands			Public Lands		
	Acres	Value	Percentage	Acres	Value	Percentage
Sevenson Nursery -	118	0.008	118			
Montana						
Land and Bingham						
Crescent, Keweenaw						
National Forest,						
Yellow	107	11.148	107			
Forestwater Timber						
Protective Assn.	139	2.394	139			
Potlatch Timber						
Protective Assn.	47	1.180	47			
Total	118	2.124	118			

The reasons for survival of riparian forest by the riparian forest eradicated areas of the two riparian forest associations have been classified as shown in Table No. 2. The information under "Classification" concerns B. detritus while under "Land Association" B. detritus only has been so classified.

TABLE NO. 2

CLASSIFICATION OF LANDS FOR SURVIVAL OF B. DETRITUS

Type of Information	Chemical Classification			Land Association		
	Total	Survival	Under	Total	Survival	Under
Per cent of	22	41	16	22	41	16
Preservation						
Per cent of	4,119	28	28	4,119	28	28
Test 1.2						
Test 1.2						
Per cent	22	10	9	22	10	9



The term "Total Miss" as used in Table No. 2, means that bushes so classified were not found by the eradicators. The terms "Insufficient Spray" and "Incomplete Pull" mean that the bushes were found but unsuccessfully eradicated. All of these terms express the human element in eradication and are avoidable.

The term "Under Water When Sprayed" includes growth from portions of stems under water when sprayed. When the water receded, leaves formed on these portions although the rest of the plants were killed. This is an unavoidable situation when the water is high. The most effective time of spraying in such situations is after the water has receded.

It is evident from Table No. 2 that a much higher per cent of bushes surviving eradication occurred as missed bushes under hand eradication of R. lacustre than under chemical eradication of R. petiolare. A possible basis for explanation lies in the fact that R. petiolare commonly was found as clumps while R. lacustre occurred as scattered bushes and consequently were harder to find.

In regard to missed R. petiolare bushes, a few instances were noticed during the season where entire eradication strips were missed. A crew would stop spraying at a certain string line at the end of the day and the following morning inadvertently start spraying at the wrong string line. This was easy to do because the effect of the previous day's spraying would not show up and all bushes looked alike because the dew would still be on. This oversight could be avoided by better marking the end of the sprayed area.

In Table No. 3 the "Total Misses" have been classified according to shading.



The term "Total Area" as used in Table No. 3, means the  
prizes as classified and set forth by the "Inventive  
"Inventive Energy" and "Inventive Energy" means that the prizes are  
found but unsuccessfully awarded. All of these prizes are  
human element in evaluation. All are available.

The term "Total Area" as used in Table No. 3, means the  
prizes as classified and set forth by the "Inventive  
"Inventive Energy" and "Inventive Energy" means that the prizes are  
found but unsuccessfully awarded. All of these prizes are  
human element in evaluation. All are available.

It is evident from Table No. 3 that a much higher level of  
prizes surviving evaluation occurred as prizes under Table  
evaluation of R. Invention than under evaluation of R. Invention.  
A possible basis for evaluation lies in the fact that R. Invention  
commonly was found as prizes while R. Invention occurred as prizes  
prizes and consequently were harder to find.

In regard to the R. Invention prizes, a few prizes were  
noticed during the season when entire evaluation prizes were  
a crew would stop spraying at a certain stage, like at the end of the  
day and the following morning inadvertently start spraying at the  
stage line. This was easy to do because the effect of the  
stage's spraying would not show up and all prizes would be  
the new would still be on. This oversight could be avoided by  
marking the end of the sprayed area.

In Table No. 3 the "Total Area" have been marked as  
ing to shading.



TABLE NO. 3.

BUSHES TOTALLY MISSED CLASSIFIED ACCORDING TO SHADING

Type of Eradication	Basis	Shading		
	Bushes or F.L.S.	Open	Shade	Shade
Chemical Eradication				
% of total missed bushes	97 bushes	60%	24%	16%
% of total missed F.L.S.	2,829 F.L.S.	48%	34%	18%
Average F.L.S. per missed bush		23 $\frac{1}{2}$	42	32
Hand Eradication				
% of total missed bushes	2,204 bushes	13%	69%	18%
% of total missed F.L.S.	34,528 F.L.S.	14%	75%	11%
Average F.L.S. per missed bush		17	17	10

An examination of Table No. 3 shows the following facts:

1. The lowest per cent of misses by the chemical eradicators was in the shade, while in hand eradication the lowest per cent was in the open. Necessarily these figures are based on findings after eradication. To be truly significant we should also have the corresponding ratios of bushes growing in the different degrees of shading before eradication.

2. It may be observed that the smallest bush missed on chemical eradication was in the open while on hand eradication it was in the shade.

From data on the permanent check plots, we have derived an average figure showing the feet of live stem of R. petiolare and R. lacustre per square foot of actual area occupied by Ribes. The figures are shown below.

Total actual area of R. petiolare = 14,540.6 sq. feet.

Total F.L.S. of R. petiolare on above area = 143,562 F.L.S.

$\frac{143,562}{14,540.6} = 9.8$  F.L.S. of R. petiolare per sq. ft. of actual area.

Total actual area of R. lacustre = 2,333.8 sq. ft.

Total F.L.S. of R. lacustre = 35,278 F.L.S.

$\frac{35,278}{2,333.8} = 15.1$  F.L.S. of R. lacustre per sq. ft. of actual area.



THE EFFECT OF LIGHT ON THE GROWTH OF *Pinus strobus*

Type of radiation	1934		1935	
	Open	Shade	Open	Shade
Optical radiation	100	100	100	100
% of total height	100	100	100	100
% of total width	100	100	100	100
Average T.L.E. per season	100	100	100	100
Branch	100	100	100	100
and radiation	100	100	100	100
% of total height	100	100	100	100
% of total width	100	100	100	100
Average T.L.E. per season	100	100	100	100
Branch	100	100	100	100

An examination of Table IV shows the following results:

1. The lowest rate of growth of *Pinus strobus* was in the shade, while in open radiation the growth was in the open. Necessary light is not only a factor in the growth of *Pinus strobus*, but it is also a factor in the growth of *Pinus strobus*.

2. It may be observed that the growth of *Pinus strobus* in open radiation was in the open while in shade radiation it was in the shade.

From data on the permanent record, we have calculated the average height of five years of *Pinus strobus* in open radiation and the average height of five years of *Pinus strobus* in shade radiation. The figures are shown below.

Total actual area of *Pinus strobus* = 14,760.3  
Total T.L.E. of *Pinus strobus* on open area = 14,760.3  
Total T.L.E. of *Pinus strobus* on shade area = 14,760.3

Total actual area of *Pinus strobus* = 14,760.3  
Total T.L.E. of *Pinus strobus* on open area = 14,760.3  
Total T.L.E. of *Pinus strobus* on shade area = 14,760.3



These factors of feet of live stem of different *Ribes* species per square foot of actual area will be very useful. We are planning on using the square foot of actual area as an infection factor, hence any well-founded factor of feet of live stem per area unit will constitute a transition factor between feet of live stem and infection data, as well as an aid in estimating feet of live stem.

B. Results of Checking on Lamb and Binarch Creeks, Kaniksu National Forest, Idaho.

Certain areas on Lamb and Binarch Creeks were eradicated by hand in 1926 and portions were re-eradicated by hand in 1928.

Table No. 4 shows the results of checking on these areas.

TABLE NO. 4.

RESULTS OF CHECKING ON LAMB AND BINARCH CREEKS, KANIKSU NATIONAL FOREST, IDAHO.

Eradication		Number		Ribes F.L.S. Per Acre After Eradication		
Type	Status	Plots	Mil- acres	R. inermis	R. lacustre	Total
Stream	Eradicated 1926	18	2,460	1,557	114	1,671
Stream	Eradicated 1926, 1928	117	2,688	116	92	208
Upland	Eradicated 1926	1	5,800	0	20	20
Upland	Eradicated 1926, 1928	1	3,200	0	0	0

It is apparent from Table No. 4 that the great bulk of *Ribes* left after eradication was found in the stream type. It is also evident that the 1928 eradication was chiefly effective in the reduction in the amount of *R. inermis* in the stream type.

C. Results on Other Areas Checked.

The results of checking at Savenac Nursery, Montana and on the eradicated areas of the Clearwater and Potlatch Timber Protective Associations are shown following the reports on eradication on the respective areas.



These factors of least of five years of different species per square foot of actual area will be very small. Planning on using the square foot of actual area as an indication factor, hence any well-founded factor of five years area will constitute a transition color between least of five years and infection data, as well as an indication factor of five years.

## 5. Results of Checking on Lamb and Ranch Creek, Lamb Creek Forest, Idaho.

Certain areas on Lamb and Ranch Creek were established in 1936 and portions were re-established in 1937. Table No. 4 shows the results of checking on these areas.

TABLE NO. 4.

## RESULTS OF CHECKING ON LAMB AND RANCH CREEK, KAMATH NATIONAL FOREST, IDAHO.

Type	Status	Plots	Acres	Number	After eradication	
					Before	After
Stream	eradicated	18	8,430	1,327	114	1,327
Stream	eradicated	117	8,338	110	73	110
Upland	eradicated	1	2,000	0	23	23
Upland	eradicated	1	2,800	0	0	0

It is apparent from Table No. 4 that the great bulk of the left after eradication was found in the stream type. It is also evident that the 1936 eradication was chiefly effective in the removal in the amount of *B. inermis* in the stream type.

## C. Results on Other areas Checked.

The results of checking of several creeks, canyons and the eradicated areas of the Clearwater and Hoback River protective associations are shown following the reports on eradication on the respective areas.



## FUTURE PLANS

It is expected that checking in 1930 will follow much the same plan as that used in 1929. However, it is planned not to do any checking by temporary plots until the eradication work is completely finished. Checking to find out how well the men are doing the work will and should be determined by men on the eradication projects. Checking by men on the "Damage to Pine" project will be done to form a basis for evaluating the work accomplished in terms of pine protection.

## COSTS

The costs for the entire calendar year for the Damage to Pine project No. 4.2 is shown below. This includes the cost of checking and damage to pine study plots.

TABLE NO. 5.

### COSTS OF PROJECT 4.2 FOR 1929

I t e m	Cost	Per Cent of Total
Salaries	\$7,494.61	72.6
Subsistence	1,625.93	15.8
Personal Auto	683.15	6.6
Other Travel	298.27	2.9
Equipment	193.90	1.9
Miscellaneous	21.60	0.2
Total	\$10,317.26	100.0

The salary item forms a high per cent of money spent on this project because it includes a large part of the time of three members of the permanent personnel for the entire year.

There is shown below an estimate of the money expended on each of the two major divisions of this project. Owing to the fact that work was done on each part by the same men at different times throughout the summer it was impractical to segregate items very accurately. The estimate, therefore, is simply a conscientious approximation.

In	Estimated cost of checking	-	\$2,000.00
	Estimated cost infection plots	-	8,317.26
	Total		\$10,317.26



## REFERENCES

a basis for evaluating the work accomplished in terms of the program. Checking by men on the "Message to Rins" article will be done in the fall and should be determined by men on the translation etc. etc.

limited. Checking to find out how well the "Message to Rins" article was accepted by temporary plant until the situation here is stabilized. However, as it seemed safe to do so, it is suggested that it be used in the same plan as first used in 1960.

It is suggested that all follow-up work be done in the fall.

## 21250

The costs for the entire calendar year for the project are shown below. This includes the costs of the entire project no. 4.2 is shown below.

# MEAT

[illegible]

The salary item forms a small part of the total cost of the project because it includes a large part of the time of the Government personnel for the entire year.

There is shown below an estimate of the load on each of the two major divisions of the project. Only so much of the work was done on each half of the same as to have the work throughout the summer it was impractical to estimate that was accurately. The estimate, therefore, is simply a rough estimate.

- Estimated cost of checking  
- Estimated cost insecticide



## RIBES ERADICATION IN NORTH IDAHO.

By

C. C. Strong,  
Associate Forester.

The activities of the experimental Ribes Eradication Project in the Inland Empire, although varied in nature and function, are all aimed at the common object, namely, development of the most effective and cheapest method of destroying Ribes in stands of white-pine timber or in and around forest nurseries where white pine is grown for planting purposes. Cooperative Ribes eradication, first undertaken at Big Creek on the Priest Lake Timber Protective Association in 1928 and enlarged on the Potlatch and Clearwater Timber Protective Associations in 1929, is the first instance of Ribes eradication for purely protective purposes. The Ribes eradication project has taken the lead in (1) development of Ribes eradication methods and (2) assisting private and state timber owners in instituting Ribes eradication on a control basis to protect their own white-pine timber against damage by blister rust.

In 1929, plans for the Ribes Eradication Project were made to include those activities which had an immediate bearing on the most urgent problems. In view of the previous decision to institute Ribes eradication in stream type only as the first step in controlling blister rust, it was felt that experimental Ribes eradication on other than stream type could be suspended for 1929 in favor of more urgent experimentation. It should be borne in mind that stream type includes that area immediately bordering streams and perpetually damp places where in most cases an abundance of Ribes, highly susceptible to blister rust, grow. Destruction of Ribes from stream type, it was felt, would remove so much of the hazard from blister rust that the disease might never become established in many places if Ribes were not destroyed in time. Furthermore, even if the rust did become established the destruction of such a high percentage of the most susceptible Ribes might result in very little future damage to pine by the disease. Hence, in the following eradication reports the acreage shown as actually worked includes only stream type except where contrary procedure is specifically stated. Also acreages of white-pine timber shown as protected will, in all cases, include only that area drained by streams flowing through or contiguous to the stream type worked.

10. In all cases methods employed at the beginning of the 1929 season by any project were those most highly developed for similar work in the past. So much has been written in previous reports, especially in the 1928 report of the Western Office, about hand-pulling methods that very little further explanation regarding the same was



RIVER RECLAMATION IN NORTH CAROLINA

Associated Press

The activities of the engineering and construction project in the inland Empire, although varied in nature and function, are aimed at the common object, namely, development of the water resources and the method of destroying them in order to prevent the river or in and around forest nurseries where they are growing for planting purposes. Cooperative River reclamation project at Big Creek on the first large river reclamation project in the South and enlarged on the project and of the river reclamation project Association in 1929, is the first instance of River reclamation project in the South. The River reclamation project has been the lead in (1) development of the river reclamation project in the South, assisting private and state timber lands in the reclamation project on a control basis to protect them from white-pine blight damage by blight fungi.

In 1902, plans for the River reclamation project were made to include those activities which had no immediate bearing on the river reclamation project. In view of the previous action to reclamation project eradication in stream type only as the first step in controlling blight fungi, it was felt that experimental blight eradication on stream type could be expanded for use in favor of more vigorous experimentation. It should be borne in mind that stream type eradication is not immediately bordering streams and forest lands, but there in most cases an abundance of River, blight, resistance to blight fungi. Destruction of blight from stream type, if it were felt, would remove so much of the hazard from blight that the disease might never become established in many places it attacks now. Furthermore, even if the blight did become established the destruction of such a high percentage of the most susceptible River blight result in very little damage to the river by the disease. Hence, in the following eradication reports to the State shown as especially worked from only stream type eradication, where contrary procedure is specifically stated. Also noted in the white-pine blight shown as protected will, in all cases, blight and that are drained by stream flooding through or around the stream type worked.

In all cases methods employed at the beginning of the season by any project were those most fully developed for blight work in the past. So much has been written in previous reports, especially in the 1929 report of the Eastern Office, and in the 1930 methods that very little further explanation regarding the work was



felt necessary in the 1929 reports. In the case of spraying, both by knapsack and power, the methods are described in detail in two 1929 reports by H. E. Swanson.

Establishment of cooperative Ribes eradication on the lands of the Potlatch and Clearwater Timber Protective Associations offered one problem rather difficult of solution. A relatively large percentage of the acreage within the white-pine portions of the two associations is owned by people who, because they are financially unable, have no concern or because their lands may be heavily populated with Ribes and have little or no white pine, will not cooperate at the present time in financing Ribes eradication. Other owners were willing to help protect their own lands but were reluctant to assume the burden on other areas which, of course, would have to be worked if full protection was to be afforded all areas within a particular drainage. It was partially for the reason mentioned that the Federal Government consented to spend two dollars for each dollar spent by private owners in protecting such areas from damage by the rust instead of expending appropriations for cooperative work on the usual "dollar for dollar" basis.

Reports on the various activities of the eradication projects were written by the persons who supervised the work in the field except in cases where the men who supervised the field work were temporarily absent or assigned other duties. The reports, in the order in which they appear are as follows:

1. Methods Employed in Chemical Eradication of Ribes.....	C. C. Strong
2. Methods of Chemical Eradication.....	H. E. Swanson
3. Records of Performance of Motors Used and Results of Test Runs.....	B. A. Ganoung
4. Knapsack Spraying Equipment Report, 1929.....	J. F. Breakey
5. Experimental Stream Type Re-eradication.....	H. F. Geil
6. Re-eradication of Ribes by Hand Pulling Methods, Idaho, 1929.....	C.O.Peterson
7. Experimental Application of Ribicides.....	C.C.Strong W.G.Guernsey H.R.Offord
8. Pre-eradication Survey on Private and Federal White- Pine Lands.....	W.G.Guernsey
9. Cooperative Local Control, Clearwater Timber Pro- tective Association.....	B.A.Anderson
10. Results of Checking on the Areas Eradicated of Ribes in the Clearwater Timber Protective Association, Idaho, 1929.....	H.N.Putnam



felt necessary in the 1929 report. In the case of certain, but not all, methods and power, the methods are described in detail in the 1929 report by R. H. Swanson.

Establishment of cooperative timber associations on the lands of the Forest and Watership Timber Association offers one problem rather difficult of solution. Relatively large percentages of the acreage within the water-shed sections in the two associations is owned by people who, because of the timber, have no concern or because their lands may be heavily bogged with timber and have little or no white pine, will not cooperate in the present time in limiting timber production. Of course, were willing to help protect their own land but were not willing to bear the burden on other lands which, of course, would have to be protected. Full protection was to be afforded all areas within the water-shed. It was partially for the reason mentioned above that the Government consented to spend two dollars for each dollar spent by private owners in protecting such areas from damage by the forest. The expenditure of appropriations for cooperative work on the water-shed for dollar basis.

Reports on the various activities of the timber association projects were written by the persons who supervised the work in the field except in cases where the men who supervised the field work were temporarily absent or assigned other duties. The reports, in the order in which they appear are as follows:

1. Methods employed in chemical eradication of insects..... R. H. Swanson
2. Methods of chemical eradication..... R. H. Swanson
3. Records of performance of motors used and results of test runs..... R. H. Swanson
4. Backpack Spraying Equipment Report, 1929..... R. H. Swanson
5. Experimental Stream Type Re-eradication..... R. H. Swanson
6. Re-eradication of hives by hand, rifle, and traps..... R. H. Swanson
7. Experimental Application of Bicides..... R. H. Swanson
8. Pre-eradication Survey on Private and Federal Lands..... R. H. Swanson
9. Cooperative Local Control, Watership Timber Protective Association..... R. H. Swanson
10. Results of Checking on the Trees Protected by Hives in the Watership Timber Protective Association, Idaho, 1929..... R. H. Swanson



- |  |                |
|--|----------------|
| 11. Cooperative Local Control, Potlatch Timber Protective Association.....   | W. G. Guernsey |
| 12. Results of Checking on the Areas Eradicated of Ribes in the Potlatch Timber Protective Association, Idaho, 1929..... | H. M. Putnam   |

The report on "Experiments With Spraying Methods and Equipment, Morro Creek, California" by H. E. Swanson appears under the "General" heading near the end of the 1929 annual report of the Western Office.



- 11. Cooperative Local Medical Association, Portland, Oregon
- 12. Results of studies on the effects of the use of the X-ray in the treatment of cancer
- 13. Association, Kansas, Nebraska

The report on "Experiments in the treatment of cancer" by Dr. J. H. Swenson, M.D., of the University of California, San Francisco, California, is being prepared for publication. The report is being prepared for publication by the American Cancer Society, New York, New York.



METHODS EMPLOYED IN ERADICATING RIBES BY APPLYING  
TOXIC SPRAYS

By

C. C. Strong,  
Associate Forester.

Some eradication of *Ribes* by means of applying toxic sprays was done by each eradication project in north Idaho in 1929. The amount of such work depended upon conditions encountered. The activities of each project are necessarily reported separately. In order to prevent duplication regarding spraying methods used the following description is here inserted rather than in each report. It is the aim to make this description of methods used apply to all projects except where special experiments made necessary a system or method peculiar to that project only. In that case detailed descriptions accompany the project report involved.

As men reported for duty they were placed on hand-pulling crews until they were familiar with the aims and purposes of the operation and acquainted with the various species of *Ribes*. In the region where work was being done *R. petiolare*, *R. lacustre* and *R. inerme* bushes grow intermingled but *R. petiolare* bushes occur usually in heavy concentrations while bushes of the other two species grow more or less singly. All *R. lacustre* and *R. inerme* bushes were hand pulled, chiefly because no chemical had yet been found which would kill these bushes at a cost which was not prohibitive. *R. petiolare* bushes are killed by applying a spray the basic component of which is sodium chlorate ( $\text{NaClO}_3$ ). Atlacide, basically calcium chlorate and calcium chloride, is very effective when applied to this species. Hand pulling was the only operation on areas having no *R. petiolare*. On areas having *R. petiolare*, however, three operations were necessary, namely, spraying, hand pulling and (toward the end of the season) re-spraying along the water courses where some bushes were partially under water when original spraying was done and, hence, not killed.

Because very few men were available who had had previous experience with spraying methods as means of eradicating *Ribes*, it was possible to start only one spraying crew of 5 men at a time. When that crew was functioning smoothly, another was started and the practice continued until there was the proper balance between spraying and hand pulling. Matters were so arranged that all men got experience at both hand pulling and spraying during the season. Both methods of work have been described so frequently in previous reports that they will not be further discussed here except to say that the spraying crew consisted of 4 knapsack men and a foreman, while the hand-pulling crew usually numbered from 2 to 4 men including the foreman, depending on conditions encountered.



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method peculiar to that project only. In that case detailed description of the project except where special experiments were necessary, is given. It is the aim to make this description of methods as self-explanatory as possible. In order to prevent duplication regarding technical details in the description of each project are necessarily reported separately. The amount of such work depends upon conditions encountered. The work done by each eradication project in North Idaho in 1952. The Some eradication of Ribes by means of spraying.

As men reported for duty they were placed in small groups and until they were familiar with the aims and purposes of the operation and acquainted with the various methods of operation. In the season where work was being done E. petiolata, E. lineata and E. lineata bushes grow intermingled but E. petiolata bushes occur in small concentrations while bushes of the other two species are more or less singly. All E. lineata and E. lineata bushes were hand pulled, because no chemical had yet been found which would kill them without a cost which was not prohibitive. E. petiolata bushes are killed by applying a spray the basic component of which is sodium cyanide ( $\text{NaCN}$ ). Alkyls, basically calcium cyanide and sodium cyanide, are very effective when applied to this species. Hand pulling was the only operation on areas having no E. petiolata. On areas having E. petiolata, however, three operations were necessary, namely, spraying, hand pulling and toward the end of the season re-spraying along the outer contour where some bushes were partially under water when originally the area was flooded and hence not killed.

[illegible]



Two types of spray tanks were used. One was the curved-back type with the canvas back rest laced to the two flanges of the tank. (This tank has been patented by this office.) The other type is the flat slightly crescent-shaped tank which is strapped to a specially built "Trapper-Nelson" pack frame. This latter type, due partially to the lightness and flexibility of the unit and partially to the usefulness of the pack frame in packing chemicals and supplies to inaccessible areas, has proven the better of the two types.

The "Brown double-action hand pump" proved very much more satisfactory than the single-action pump used in previous work. A few minor changes will make it an excellent pump and one which will stand the severe treatment to which spraying equipment is subjected.

Atlacide was the chemical mixture mostly used for spraying R. petiolare. It was made into a solution by adding 1.4 pounds to each gallon of water. The agent mixed into the spray to cause it to spread evenly over and stick to the leaf surface was a stock solution made by dissolving one pound of flake glue in 3 gallons of water. A quantity of sodium chlorate ( $\text{NaClO}_3$ ) and calcium chloride ( $\text{CaCl}_2$ ) was left on hand from the previous season. Wherever this chemical was used for making spray it was used in the ratio  $\text{NaClO}_3$  .9 pound,  $\text{CaCl}_2$  .54 pound, water 1 gallon. The usual glue spreader and sticker was added.

Any area sprayed less than one hour before a heavy shower was resprayed because it was felt that the rain would wash off the chemical from the leaves before the desired absorption of toxic chemicals took place. However, there was so little rain during the 1929 field season that practically no respraying from this cause was necessary.

On all operations except the experimental chemical application unit at Clarkia, Idaho, it was aimed to have all spraying completed by September 1. It was feared that inefficiency might result from any spraying after that date due to decreasing anabolism in Ribes plants.

Heavy galvanized tanks of 10 to 14 gallons capacity were used during the season as mixing vessels.



Two types of spray tanks were used. The first was a back type with the canvas back fast to the tank. The second was a tank. (The tank was back fast to the tank.) The first type of tank was used for spraying the leaves of the plants. The second type of tank was used for spraying the ground. The first type of tank was used for spraying the leaves of the plants. The second type of tank was used for spraying the ground.

The "Brown" single-action pump was used. It was used for spraying the leaves of the plants. It was used for spraying the ground. It was used for spraying the leaves of the plants. It was used for spraying the ground.

The chemical mixture was made up of 1.4 parts of each gallon of water. The chemical mixture was made up of 1.4 parts of each gallon of water. The chemical mixture was made up of 1.4 parts of each gallon of water. The chemical mixture was made up of 1.4 parts of each gallon of water.

Any area sprayed less than one hour before a heavy rain was resprayed because it was felt that the rain would wash off the chemical. However, there was no little rain during the 1933 season. That practically no respraying from this cause was necessary.

On all operations except the experimental chemical application, it was aimed to have all plants covered. It was aimed to have all plants covered. It was aimed to have all plants covered. It was aimed to have all plants covered.

Heavy calvinized tanks of 10 to 14 gallons capacity were used during the season as mixing vessels.



## METHODS OF CHEMICAL ERADICATION

By

H. E. Swanson,  
Agent

### INTRODUCTION

In the chemical eradication of wild currants and gooseberries, a practical method of spraying with knapsack equipment had been developed during the 1928 season. All comparisons between work performed by this method with that performed by power equipment indicated that the knapsack method was the more practical. However, in the heavier concentrations of *Ribes*, the power method showed possibilities of being the better. In all previous work with power spraying equipment problems had been a handicap and had been detrimental to final results. During the 1929 season, all equipment was made uniform, auxiliary motors were available, and a capable mechanic was on hand to take care of any motor troubles which arose. The work was started on July 1 and completed on September 6, 1929.

### PURPOSE

The principal purpose of the methods project was to place power spraying methods on a practical basis. This included the further development of suitable equipment for the power unit as well as the trial of a method of spraying. Subordinate to this aim were further studies in knapsack spraying along methods of work and improvement in equipment. However, this phase of the work was better taken care of in the other chemical eradication projects where all the work was performed with knapsack equipment.

### LOCATION AND DESCRIPTION OF AREA

Musselshell Creek on the Clearwater National Forest in township 35 north and township 36 north, range 6 east of the Boise Meridian was the area on which the work was performed. Starting at the Musselshell Ranger Station, approximately eight miles of stream type was worked along Musselshell Creek itself, leaving the headwaters in section 23, township 36 north, range 6 east to be worked from a fly camp at a future date. Seven miles of this was worked by power spraying methods. The width of the stream type varied from two chains to fourteen chains, with the average between three and four chains. The concentration of *Ribes* was fairly uniform and would constitute about 15% of a complete ground cover. *Ribes petiolare* predominated, with a scattering of *R. lacustre* along the whole drainage and patches of *R. inerme* at the lower end of the area. The tributaries to Musselshell Creek were also worked. The largest of these, Gold Creek, was worked with knapsack sprayers. The other tributaries were eradicated by hand. The headwaters of Jim Brown Creek in sections 6 and 7, township 35 north, range 6 east, and also in



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## INTRODUCTION

The work was started on July 1 and continued on September 1, 1938. In the chemical analysis of wild corn and the corresponding practical method of spraying with insect sprays had been started during the 1938 season. All comparisons between work performed by the method with that performed by power equipment indicated that the power-sack method was the more practical. However, in the matter of comparisons of types, the power method showed possibilities of being the better. In all previous work with power sprayer equipment problems had been encountered and had been detrimental to final results. During the 1938 season, all equipment was made uniform, auxiliary motors were available, and a capable mechanic was on hand to take care of any motor troubles which arose. The work was started on July 1 and continued on September 1, 1938.

## 420321

The principal purpose of the methods project was to improve spraying methods on a practical basis. This included the introduction of suitable equipment for the power unit as the main method of spraying. Subordinate to this aim were further studies in knapsack spraying along methods of work and improvement in equipment. However, this phase of the work was better taken care of in the other chemical eradication projects where all the work was performed with knapsack equipment.

LOCATION OF SUBSCRIPTION

The headwaters were eradicated by hand. The headwaters of the Brown Creek, sections 6 and 7, township 35 north, range 8 east, and also in these, Gold Creek, was worked with muskego sprayers. The trappers to Musasaphah Creek were also worked. One trap of the whole drainage and bottom of R. Ingersoll at the lower end of the ridge petiolate predominated, with a scattering of R. leucurus below fairly uniform and would constitute about 10% of a complete ground cover. The concentration of heavy chains between three and four chains. The stream type varied from two chains to fourteen chains, and seven miles of this was worked by power spraying methods. The width of Musasaphah Creek itself, leaving the headwaters in section 22, township 35 north, range 8 east to be worked from a fly camp at a future date. Station approximately eight miles of stream type was worked along trees on which the work was performed. Starting at the Musasaphah Creek, 35 north and township 35 north, range 8 east of the Lake Umbagog Forest in the Musasaphah Creek on the western National Forest in the



the east half of section 31, township 36 north, range 6 east to the National Forest boundary was eradicated. There was approximately one mile of medium concentration of R. petiolare on this area which necessitated eradication by the use of knapsack sprayers.

A trail extending the entire length of the Musselshell Creek drainage made the area accessible for a pack string.

#### METHODS AND EQUIPMENT

This project consisted of a 15-man unit which size is very satisfactory for covering an area. A unit of this size has an advantage over a larger unit in that it eliminates the necessity of making frequent moves of the entire camp. At the same time it is possible to work all the stream from the main camp thus eliminating the additional cost and loss of time in establishing fly camps.

##### A. Power Spraying.

1. Advance work. With the aid of pre-eradication maps showing the Ribes concentration on the area, and with a pre-survey of the area by the supervisor in charge, the distribution of chemical along the drainage was made. Points along the trail designated as stations, were established and the amount of chemical to be left at these points was determined by the number of acres to be worked therefrom. These stations were established at points 1,500 feet to 1,800 feet apart along the trail, the exact location of each station being determined by the nearness of the stream to the trail and the suitability of the site at the stream for a motor set-up.

##### 2. Power unit.

###### a. Equipment.

2 motors (the second motor to be used in case of a breakdown).  
2,100 feet of  $\frac{1}{2}$ " main-line pressure hose in 100-ft. sections,  
each section fitted with Bowes couplings.  
3,000 feet of  $\frac{1}{4}$ " lateral pressure hose in 300-ft. sections.  
400 feet of  $\frac{1}{8}$ " lateral pressure hose in 200-ft. sections.  
22 Y couplings with shut-off valves.  
10 trigger nozzles with special ball check and 4-ft. extensions.  
4-14 gallon mixing tubs.  
The entire unit can be loaded on a pack string of 8 mules.

###### b. Organization 15-man unit.

Foreman  
Mechanic  
Main-line hoseman  
10 nozzle men

\*At the end of this report a record and an account of the performance of the various motors used in the project is given by E. A. Ganoung.



the east half of section 31, township 36 north, range 3 east, in the National Forest boundary was established. There was approximately one mile of medium concentration of Pinus ponderosa on this area which necessitated eradication by the use of knapsack sprayers.

A trail extending the entire length of the unsprayed trees drainage made the area accessible for a back string.

## METHODS AND EQUIPMENT

This project consisted of a 15-man unit which size is very satisfactory for covering an area. A unit of this size has an advantage over a larger unit in that it eliminates the necessity of making frequent moves of the entire camp. At the same time it is possible to work all the stream from the main camp thus eliminating the additional cost and loss of time in establishing fly camps.

### A. Power Spraying.

1. Advance work. With the aid of pre-eradication maps showing the riparian concentration on the area, and with a pre-survey of the area by the supervisor in charge, the distribution of chemical along the drainage was made. Points along the trail designated as stations, were established and the amount of chemical to be left at these points was determined by the number of acres to be worked therefrom. These stations were established at points 1,200 feet to 1,800 feet apart along the trail, the exact location of each station being determined by the bearings of the stream to the trail and the suitability of the site at the stream for a motor set-up.

### B. Power unit

a. Equipment.  
2 Motors (the second motor to be used in case of a breakdown).  
2,100 feet of 1" main-line pressure hose in 100-ft. sections.  
each section fitted with Bowes couplings.  
3,000 feet of 1/2" lateral pressure hose in 200-ft. sections.  
400 feet of 1/2" lateral pressure hose in 25-ft. sections.  
22 Y couplings with shut-off valves.  
10 trigger nozzles with special ball check and 4-ft. extensions.  
4-14 gallon mixing tank.  
The entire unit can be loaded on a pack string of 3 mules.

### b. Organization 15-man unit.

Foreman  
Mechanic  
Main-line hoseman  
10 nozzlemen

\*At the end of this report a record and an account of the performance of the various motors used in the project is given by W. E. Anderson.



### c. Method of work.

One motor is set up at the first station with two mixing tubs, one to be used as a solution tub for the intake hose of the motor and the other for a mixing container in which the chemical solution is prepared and then transferred to the other tub. It is the duty of the mechanic to operate the motor and mix the chemical.

The 2,000 feet of  $\frac{1}{2}$ " main-line hose is laid out along the area to be worked, with a Y coupling at each 100-ft. section. The position of the main-line hose is determined by the width of the stream type. In order to facilitate the work, it is essential to lay the main-line along one edge of the stream type when possible so that the men work on one side of the main-line only. This is possible where the stream type is not over 250 feet in width. In cases of a greater width the main-line is laid through the center of the stream type so as not to leave more than 250 feet on either side.\* Areas greater than 500 feet in width are covered by putting out lateral hose lines from the main-line. Where a trail is present, it is often convenient to lay the main-line along the trail. There is sufficient main-line hose so that it is not all in use at the same time. This permits the bringing forward of the main-line from the lower end to be laid out ahead, thus making a continuous line of hose up the valley.

With 2,000 feet of main-line hose available, the line, when it is all moved ahead of the motor, will extend past the next station which is 1,500 feet to 1,800 feet above. With two mixing tubs filled with solution, everything is then ready for moving the motor. This move requires about 15 or 20 minutes and is made during the noon hour or after the close of operations at the end of the day's work in order to prevent any loss of time on the part of the nozzlemen.

The actual spraying is done by the 10 nozzlemen who are each provided with a 300-ft.  $\frac{1}{4}$ " lateral hose, with a ball check, trigger nozzle, and 4-ft. extension on one end and a Bowes coupling on the other end, permitting the hose to be attached to the main-line. Each man is assigned a section of stream type 100 feet wide at right angles to the main-line and extending the entire width of the stream type. The nozzleman will work his area by strips running perpendicular to the stream and main-line. The first strip is marked out with string lines for him. He sprays this strip and when out at the end, he detaches his nozzle above the ball check, and returns to the main-line, laying a string line to mark off his next strip as he goes. Then he pulls in his hose line, merely piling it as he goes. Following that he puts on the nozzle and is ready to spray the next strip. His entire section is worked out in this manner. On completing a section the nozzleman takes his hose and moves up to the next unassigned section along the main-line.

\*The illustration following this report shows the methods of dividing and spraying an area.



## c. Method of work.

One motor is set up at the first station with the hose to be used as a solution for the intake hose in the motor and the other for a mixing container in which the chemical solution is prepared and then transferred to the other end. It is the duty of the workers to operate the motor and mix the chemical.

The 3,000 feet of 5" main-line hose is laid out along the line to be worked, with a Y coupling at each 100-ft. section. The position of the main-line hose is determined by the width of the stream type. In order to facilitate the work, it is essential to lay the main-line along the edge of the stream type when possible so that the men working one side of the main-line only. This is possible where the stream type is not over 250 feet in width. In cases of a greater width the main-line is laid through the center of the stream type so as not to leave more than 250 feet on either side. "Where a stream type is wider than 250 feet on either side, the main-line is laid out along the width are covered by putting out lateral hose lines from the main-line. Where a trail is present, it is often convenient to lay the main-line along the trail. There is sufficient main-line hose so that it is not all in use at the same time. This permits the working forward of the main-line from the lower end to be laid out ahead, thus making a continuous line of hose up the valley.

With 3,000 feet of main-line hose available, the line, when it is all moved ahead of the motor, will extend past the next station which is 1,500 feet to 1,800 feet above. With two main-line hoses filled with solution, everything is then ready for moving the motor. This move requires about 15 or 20 minutes and is made during the down haul or after the close of operations at the end of the day's work in order to prevent any loss of time on the part of the men.

The actual spraying is done by the 10 men who are provided with a 300-ft. 5" lateral hose, with a ball check, nozzle, and 4-ft. extension on one end and a Bowser coupling on the other end permitting the hose to be attached to the main-line. Each man is assigned a section of stream type 100 feet wide at the upper end of the main-line and extending the entire width of the stream type. The men will work this area by a strip running perpendicular to the stream and main-line. The first strip is marked out with string laid for him. He sprays this strip and when one at the end, he returns to his nozzle above the ball check, and returns to the main-line, laying a string line to mark off his next strip as he goes. Then he goes to the hose line, merely piling it as he goes. Following that he goes on to the nozzle and is ready to spray the next strip. The entire section is worked out in this manner. On completing a section the nozzleman takes the hose and moves up to the next unassigned section along the main-line.

\*The illustration following this report shows the method of laying and spraying an area.



The duties of the foreman are to supervise the work of the men, to assign them to sections when necessary, and to bring the main-line hose up from the rear. The duties of the main-line hoseman are to lay out the main-line hose in advance and to lay out the first strip in each section which acts as a boundary for that section. Both the foreman and main-line hoseman assist in moving the set-up and preparing the stations for meter.

Irregularities in the stream type are handled in various ways and some experience in the work is necessary for this. In narrow stream type it is often necessary to assign 200-ft. sections and spray an area by strips running parallel to the creek. Laterals can be laid out to extend up side draws or tributaries where concentrations of Ribes are heavy.

#### B. Knapsack Spraying.\*

The knapsack work was performed on areas which were obviously too light in Ribes concentration for power equipment. The individual section system was used.

Two types of spray tanks were given a trial, one with a back rest attached, the other attached to a Trapper Nelson Indian pack frame. The latter proved to be the most satisfactory from the standpoint of comfort and ease in carrying and also from the general utility of the pack frame which could be detached from the tank and used for general packing. For durability this tank is equal to the other, and is of simpler construction, which renders its initial cost much less.

The Brown double-action pumps proved satisfactory. There were certain minor defects which became noticeable in the heavy and severe treatment the pumps were given in the brush. These features can be easily remedied by minor changes in the construction of the pump.

The canvas sacks were very satisfactory for carrying chemical, when it was necessary to man-pack.

Two 10-gallon collapsible canvas buckets were given a trial as mixing containers. Although these buckets were used for a period of 15 days only they show very little wear. Their light weight and compactness make them desirable for use on areas which are more or less inaccessible. They would facilitate any knapsack work from this standpoint. Another feature which makes them desirable is that twenty or thirty of them can be loaded upon one pack animal. This type of mixing container will warrant an extensive trial next season.

\*At the end of this report, a full discussion on knapsack equipment is given by J. F. Breakey.



The duties of the foreman are to supervise the work of the men, to assign them to sections when necessary, and to make the main line close up from the rear. The duties of the main-line men are to lay out the main-line hose in advance and to lay out the fire line in each section which acts as a boundary for that section. Both the foreman and main-line men assist in moving the section and in operating the stations for motor.

Irregularities in the stream type are handled in various ways and some experience in the work is necessary for this. In narrow stream type it is often necessary to assign 3-4-5 sections and group an area of strips running parallel to the creek. Details can be left out to attend up side draws or tributaries where concentrations of Hides are heavy.

#### P. Knapsack Operating.

The knapsack work was performed on areas which were relatively too light in Hides concentration for power equipment. The knapsack section system was used.

Two types of spray tanks were given a trial, one with a pump rest attached, the other attached to a tripod. Wilson Indian Park trials. The latter proved to be the most satisfactory from the standpoint of comfort and ease in carrying and also from the general utility of the pack frame which could be detached from the tank and used on general bedding. For durability this tank is equal to the other, and is a simpler construction, which renders its initial cost much lower.

The Brown double-action pumps proved satisfactory. The pumps certain minor defects which became noticeable in the heavy and rough treatment the pumps were given in the rough. These defects can be easily remedied by minor changes in the construction of the pump.

The canvas sacks were very satisfactory for carrying hides, when it was necessary to hand-pack.

Two 10-gallon collapsible canvas buckets were given a trial in mixing containers. Although these buckets were used for a trial in the days only they show very little wear. Their light weight and compact make them desirable for use on areas which are more or less inaccessible. They would facilitate any knapsack work from this standpoint. Another feature which makes them desirable is that twenty or thirty of them can be loaded upon one pack animal. This type of mixing container will warrant an extensive trial next season.

\*At the end of this report, a full discussion on knapsack equipment is given by L. A. Hisecky.



# RESULTS OF WORK

TABLE NO. 1.

## SUMMARY OF CHEMICAL ERADICATION PERFORMED ON MUSSEL-SHELL AREA 1929

Method	Ribes Concentration	Man-Days	Gallons Chemical	Acres	Data Per Acre			Total Cost
					Man-Days	Gallons Chemical	Cost	
Power	Medium	370.5	10,893	270	1.35	40.3	\$24.79	\$6,693.19
Knapsack	Light	78.5	1,464	99	.79	14.8	11.91	1,179.21
Total		449.0	12,357	369	1.22	33.5	\$21.33	\$7,872.40

TABLE NO. 2.

## SUMMARY OF HAND ERADICATION PERFORMED ON MUSSEL-SHELL AREA - 1929

Type	Man-Days	Acres	No. Ribes Pulled					Data Per Acre			
			R. lac.	R. pet.	R. vis.	R. iner.	Total Ribes	Man-Days	Ribes	Cost	Total Cost
Stream	136.5	373	40,613	23,466	873	809	65,761	.37	176	\$4.46	\$1,662.99

TABLE NO. 3.

## SUMMARY OF ALL ERADICATION PERFORMED ON MUSSEL-SHELL AREA - 1929.

Man-Days	Pounds Chemical	Acres Eradicated	Cost	Acres Protected	Per Cent of Area Stream Type	Cost Per Acre to Eradicate	Cost Per Acre to Protect
585.5	17,250	742	\$9,535.39	11,150	6.65	\$ 12.85	\$0.89



# TABLE NO. 2

## SUMMARY OF CHEMICAL ANALYSIS

1933

Method	Concentration	Man-Days	Galena	Acres	Per Cent	Total
Power	Medium	370.5	10,693	270.1	4.1	\$2,100.00
Knack Light		78.0	1,464	39.73	14.6	1,100.00
Total		448.5	12,157	309.83	28.7	\$3,200.00

## TABLE NO. 3

SUMMARY OF PAID EXPENDITURE - 1933

Type	Days	Acres	Per Cent	Man-Days	Total
Stream	136.5	373.40	61.8	23,468	\$2,100.00

## TABLE NO. 4

SUMMARY OF ALL EXPENDITURE - 1933

Man-Days	Per Cent	Acres	Per Cent	Total
882.5	17.250	143.39	11.100	\$3,200.00



TABLE NO. 4.

## STATEMENT OF COSTS.

I t e m		Cost
Salaries	Supervisors	\$2,471.34
	Temporary men	2,098.30
Subsistence	Salaries of cooks	275.00
	Cost of food	969.01
	Transportation of food	221.90
General Equipment	Cost	229.12
	Transportation	139.67
Spraying Equipment		785.01
Miscellaneous	Supplies	57.18
	Expenses	150.20
	Repairs	384.12
	Twine	38.26
Chemical	Cost	1,381.16
	Transportation	141.45
Transportation of men		193.67
Total		\$9,535.39

TABLE NO. 5.

## COST OF MEALS SERVED.

Cooks' salary and expenses. . . . .	\$275.00
Cost of food used . . . . .	969.01
Cost of transporting subsistence supplies	221.90
Total cost subsistence . . . . .	\$1,465.91
Total number meals served . . . . .	2,964
Average cost per meal . . . . .	\$0.495

## CONCLUSION

The results of the work performed by the power unit, together with actual observation of the work, indicate that there is a field for this type of unit. Areas similar to Musselshell Creek, with a wide stream type and heavy concentration of Ribes, can be eradicated at a low cost with the power equipment. It is possible and it is also recommended that power units be organized to eradicate areas comparable to the Musselshell area, even though the total acreage to be so eradicated amounts to only 75 or 100. The power unit can be adapted to this size of an area by reducing the 13-man unit to a 7-man unit, requiring



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10.00	.....	Cook's salary and expenses
10.00	.....	Cost of food used
10.00	.....	Cost of transporting maintenance supplies
10.00	.....	Total cost maintenance
10.00	.....	Total number meals served
10.00	.....	Average cost per meal

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The results of the work performed by the town and, together with actual observation of the work, indicate that there is a wide spread type of unit. Areas similar to Muskegon have been noted in stream type and heavy concentration of timber, can be indicated at low cost with the power equipment. It is possible that it is also recommended that power units be organized to eradicate the competition to the Muskegon area, even though the total acreage to be so eradicated amounts to only 75 or 100%. The power unit can be directed to the size of an area by reducing the 12-man unit to a 7-man unit, and



only one-half of the amount of equipment used in the large unit. The same method of spraying would be used, the only change being the decrease in the distance between stations, which is not a factor that will affect costs to any appreciable extent. The office possesses two single-cylinder motors which will handle satisfactorily this size of a unit.

Although considerable progress has been made in adapting spraying equipment to blister-rust-control work, there are certain features which are yet to be improved. The principal difficulty seems to be in getting a type of equipment which will stand the severe treatment which necessarily results from performing the work in the brush. Efforts are being made to remedy the defects, and also to find some method with which to treat the equipment in order to preserve it against any action from the chemical.

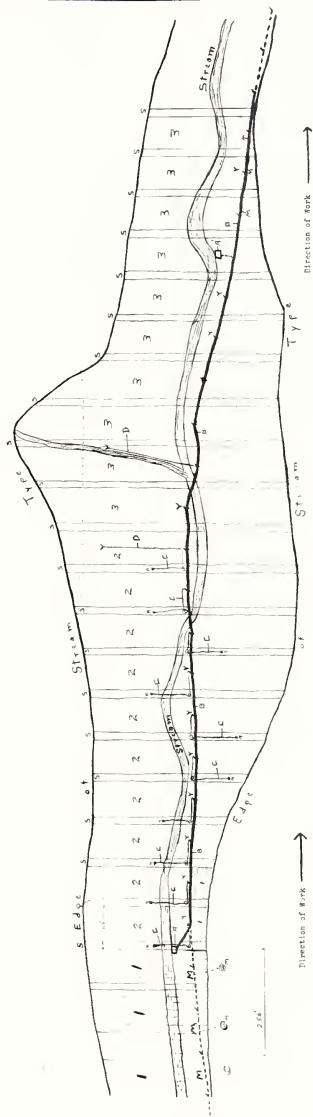


only one-half of the amount of equipment used in the first unit.  
The same method of spraying would be used, the only change being that  
decrease in the distance between locations, which is not a factor that  
will affect costs to any appreciable extent. The only decrease would  
single-cylinder motor which will enable maintaining the same  
a unit.

Although a satisfactory program has been made in California  
spraying equipment for blaster-type control work, there are certain  
features which are yet to be improved. The principal difficulty seems  
to be in getting a type of equipment which will stand the severe  
treatment which necessarily results from controlling the work in the  
brush. Efforts are being made to remedy the defects, and also to find  
some method with which to treat the edge land in order to preserve it  
against any action from the adjacent.



# LINE BACK AT CHANGING POSITION OF RIVER



- A - Power station.
  - B - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - C - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - D - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - E - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - F - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - G - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - H - Ten man line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - I - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - J - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - K - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - L - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - M - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - N - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - O - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - P - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - Q - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - R - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - S - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - T - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - U - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - V - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - W - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - X - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - Y - Wire line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
  - Z - Main line base - 2,000 feet of 1/2" pressure hose in 100-foot sections.
- Then the proposed method of applying was employed strips were usually laid out in the manner shown above for power spraying. Filling stations were set up as nearly as the dividing line between the strips as was convenient.







RECORD OF PERFORMANCE OF MOTORS USED AND RESULTS OF TEST RUNS

By  
B. A. Ganoung,  
Agent.

PERFORMANCE RECORDS

Pacific Marine Unit A-1

Motor - 2-cylinder, 2-cycle, "Johnson Outboard" type.  
Pump - Centrifugal, 5 gallons per minute at 100 pounds pressure.  
Ignition - Magneto in fly-wheel.  
Operation in field - 8 hours 1929, 117 hours previous, 125 hours total.  
Troubles 1929 - Connecting rod thrown through crankcase; crankshaft scoured; piston skirt broken.  
Changes and repairs - Unit system changed from air-cooled to solution-cooled before used in field in 1929.  
Performance - Unsatisfactory.

Ross #10, Type L-1.

Motor - 2-cylinder, 2-cycle, "Elto heavy-duty outboard" type.  
Pump - Hi-duty, small rotary, 4 gallons per minute at 100 pounds pressure.  
Ignition - Battery with open circuit timer.  
Operation in field - 77 hours 1929, 75 hours previous, 152 hours total.  
Troubles 1929 - Crankshaft broke in fly-wheel at end of 70 hours operation. Connecting rod crystallized at end of 77 hours run.  
Changes and repairs - New crankshaft, main bearings, piston rings, fly-wheel and universal points installed at end of 70 hours run. New pistons, wristpins and crankshaft installed at end of 77 hours run.  
Unit changed from water hopper-cooled to solution-cooled before start of field work 1929.  
Performance - Fairly satisfactory.

Pacific Marine #1708 Type N Fire Fighter

Motor - 4-cylinder, 2-cycle "Johnson Outboard" type.  
Pump - 35 gallons per minute at 175 pounds pressure.  
"Northern Semi-centrifugal".  
Ignition - Magneto in fly-wheel.  
Operation in field - 116 hours 1929 - purchased July 1929.  
Gas and oil consumed - 70 gallons with 3/4 pint oil in each gallon of fuel.  
Troubles - None.



PROCEED TO REMOVAL OF MOTOR AND PUMP FROM THE

F. J. Thompson  
1945

REMOVAL OF MOTOR AND PUMP

Facilities during this time

Motor - 4-cylinder, 2-cyl. "Johnson" type pump  
Pump - 4-cylinder, 2-cyl. "Johnson" type pump  
Ignition - Magneto in 11-wheel  
Operation in 1115 - 10 hours 1945, 11 hours 1946  
1945 hours total  
Troubles 1945 - Connecting rod broken, broken down, broken down  
Crankshaft broken; broken down, broken down  
Ignition and register - 1115 - 10 hours 1945, 11 hours 1946  
Cooling system - 1115 - 10 hours 1945, 11 hours 1946  
Performance - (Unusual)

Boas 1115, Type 1-1

Motor - 4-cylinder, 2-cyl. "Johnson" type pump  
Pump - 4-cylinder, 2-cyl. "Johnson" type pump  
Ignition - Magneto in 11-wheel  
Operation in 1115 - 10 hours 1945, 11 hours 1946  
1945 hours total  
Troubles 1945 - Connecting rod broken, broken down, broken down  
Crankshaft broken; broken down, broken down  
Ignition and register - 1115 - 10 hours 1945, 11 hours 1946  
Cooling system - 1115 - 10 hours 1945, 11 hours 1946  
Performance - (Unusual)

Facilities during this time

Motor - 4-cylinder, 2-cyl. "Johnson" type pump  
Pump - 4-cylinder, 2-cyl. "Johnson" type pump  
Ignition - Magneto in 11-wheel  
Operation in 1115 - 10 hours 1945, 11 hours 1946  
1945 hours total  
Troubles 1945 - Connecting rod broken, broken down, broken down  
Crankshaft broken; broken down, broken down  
Ignition and register - 1115 - 10 hours 1945, 11 hours 1946  
Cooling system - 1115 - 10 hours 1945, 11 hours 1946  
Performance - (Unusual)



Changes - Large capacity by-pass installed to allow recirculation of surplus solution pumped.

Ross B.R.C. Units No. 11 and 12.

Motor - 1-cylinder, 2-cycle "Cushman Bob-a-lawn" type, geared 4 to 1.

Pump - Ross, 2-stage rotary, 5 gallons per minute at 100 pounds pressure.

Ignition - Gear driven "Boesch" magneto.

Operation in field - 25 hours each 1929 on test work and approximately 105 hours each previous, 130 hours each total.

Changes and repairs - New water jacket cylinders cast for these units, the old air-cooling systems discarded.

Test Runs

Testing nozzle capacity of 1/4" air hose as main line.

Test made with 1,000 feet 1/4" air hose main line and 5-300 ft. laterals of same size attached at 600, 700, 800, 900 and 1,000 ft. marks respectively, nozzle No. 1 being nearest the motor, etc.

Results

Pressure at motor 105 pounds.

Pressure at end of main line with all nozzles closed, 105 pounds.

Pressure at end of main line with nozzle No. 1 opened, 79 pounds.

Pressure at end of main line with nozzles 1 and 2 opened, 50 pounds.

Pressure at end of main line with nozzles 1, 2 and 3 opened, 30 pounds.

Pressure at end of main line with nozzles 1, 2, 3 and 4 opened, 10 pounds.

Pressure at end of main line with all nozzles opened 0 pounds.

There was not sufficient pressure at nozzle No. 5 when nozzles 1, 2 and 3 were open, practically no film of spray when nozzles 1, 2, 3 and 4 were open and no spray at all when all 5 nozzles were open. Ross B.R.C. motors No. 11 and 12 used on run.

Testing 1/2" main line in contrast to 1/4" main line with same layout.

Results



Changes - Large number of new studies in all categories -

Motor - 1-Optimal; 2-Suboptimal; 3-Poor

1. The first of these is the fact that the Commission has not yet received any information from the Government of the United Kingdom regarding the results of its investigation into the alleged activities of the "Black Book" in the United Kingdom.

...and the ...

CONFIDENTIAL - SECURITY INFORMATION

252 425

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific information required.

مجلس شورای ملی

Pressure at end of main line with all valves closed, 10.5

• **abmq**

There are a number of other factors which may be considered in connection with the above.

αβγ δε

2000

1113

AM TO ME

075971 1965

20 449

1. The first group of people who were arrested were the members of the "Red Army" who were active in the city of Moscow. They were arrested in the month of May, 1937.

1. The first step is to identify the problem. In this case, the problem is that the system is not working properly.

THE OPEN AIR THEATRE

"I am not a Communist," said the man.



2425 to 2426  
2427 to 2428  
2429 to 2430

74 pounds.

Ross B.R.C. motors No. 11 and 12 used.

[illegible]



Pressure at bottom, 105 pounds.  
 Pressure at end of main line when all nozzles closed, 150  
 pounds.  
 Pressure at end of main line with nozzle No. 1 open, 100  
 pounds.  
 Pressure at end of main line with nozzle No. 1 and 2 open, 75  
 pounds.  
 Pressure at end of main line with nozzle No. 1, 2 and 3 open, 50  
 pounds.  
 Pressure at end of main line with nozzle No. 1, 2 and 4 open, 35  
 pounds.  
 Pressure at end of main line with nozzle No. 1, 2, 3 and 4 open, 25  
 pounds.  
 Pressure at end of main line with all nozzles open, 15 pounds.  
 Horse S.H.C. required at 15 and 100 feet.



## KNAPSACK SPRAYING EQUIPMENT REPORT, 1929

by  
Frank Breakey  
Agent

### INTRODUCTION

The results of experimental application of chemical eradication of wild Ribes in north Idaho during the field season of 1928 together with chemical eradication methods studies, clearly demonstrated the need of more efficient chemical eradication equipment.

### PURPOSE

The purpose of this type of experimental work was the development of better equipment for the chemical eradication of wild currants and gooseberries, the ultimate objectives being to lower the cost of operation and to increase the efficiency of the work.

### SPRAYING EQUIPMENT USED BEFORE JANUARY 1, 1929

During the field season of 1925 a three-gallon hand operated compressed air sprayer was used at Wallace and Santa, Idaho on experimental studies in the chemical eradication of Ribes. In 1926 a brass knapsack tank sprayer with rectangular ends, having a capacity of four gallons, was purchased in preference to the compressed air sprayer. The D. B. Smith Company one-way hand operated, trombone pump was used. The following year the D. B. Smith Company five-gallon galvanized iron knapsack tank was also given extensive use. The D. B. Smith trombone pump was given a second trial.

In 1928 a great deal of experimenting was done on the development of power spraying equipment and methods. The same knapsack equipment was used in 1928 as in 1927. At this time, however, it became evident that a smaller, more compact and more portable unit was necessary for use on knapsack spraying crews.

### CHEMICAL ERADICATION EQUIPMENT IMPROVEMENT

#### Methods Employed.

1. Extended study of apparatus already in existence.



KNOWLEDGE OF THE SUBJECT, 1938

Year: 1938  
Agent:

INTRODUCTION

The results of experimental application of chemical eradication of wild Ribes in north Idaho during the field season of 1938 together with chemical eradication of those species, in early 1938 demonstrated the need of more efficient chemical eradication agent.

PURPOSE

The purpose of this type of experimental work was the development of better equipment for the chemical eradication of wild currants and gooseberries, the ultimate objective being to lower the cost of operation and to increase the efficiency of the work.

STRAWING METHOD USED BEFORE 1938

During the field season of 1938 a three-gallon hand compressed air sprayer was used at Teller and Garry, Idaho on experimental studies in the chemical eradication of Ribes. In 1938 a press knapsack tank sprayer with rectangular ends, having a capacity of four gallons, was purchased in preference to the compressed air sprayer. The D. E. Smith Company one-way hand operated, two-gallon pump was used. The following year the D. E. Smith Company five-gallon galvanneal iron knapsack tank was also given extensive use. The D. E. Smith Thompson pump was given a second trial.

In 1938 a test deal of experimenting was done on the development of power spraying equipment and methods. The same back equipment was used in 1938 as in 1937. At this time, however, it became evident that a smaller, more compact and more portable unit was necessary for use on knapsack spraying crews.

CHEMICAL ERADICATION METHOD USED

Methods Employed

1. Extended study of spraying Ribes in wilderness.



TABLE NO. 1  
COMPARISON BETWEEN VARIOUS TYPES OF ENULMENT USED IN KNAPSACK SPRAYING OF RUBES TO CONTROL WHITE-PINE BLISTER RUST AS DETERMINED BY EXTENSIVE INVESTIGATION AND TESTS

Item Tested	Manufacturer	Mechanical Construction	Comparative Operating Base	Construction Not Suited to Our Purpose	Comparative Length of Life	Greatest Strain Subjected	Average Working Strain
A. Knapsack tanks.	D. B. Smith Co.	Sawmilled sheet metal. Knapsack tanks.	Difficult.	Flatting edges. Sewn, gave way.	Medium.	40# load.	35# load.
B. Canvas knapsack.	Office of Blister-Burst Control direction - samples.	Waterproof duck. Canvas sack waterproofed after manufacture.	Difficult.	Canvas porous, leaked.	Light.	50# load.	40# load.
	Charles Treacor. Glacé-mack Iron.	Wooden frame, canvas. All wood.	Easy.	Canvas porous, leaked.	Light.	50# load.	40# load.
C. Packboards.	Office of Blister-Burst Control direction - samples.	Sealed, leads, wire cover. Iron on base, wire covering iron base. Channel iron base.	Difficult.	Long protruding ends. Uncomfortable.	Light.	150# load.	40# load.
		Canvas cover. Sealed base, canvas cover.	Easy.	Canvas porous, leaked.	Light.	150# load.	40# load.
D. Pack straps	Office of Blister-Burst Control direction - samples.	Strap iron - fibre board. Fibre board - no webbing, 1 and 2 inch webbing.	Variable.	Cuts clothing, wire breaks.	Medium.	150# load.	40# load.
		Heavy. Fiberglass, 1 inch light, 2 inch medium, 3 inch heavy.	Easy.	OK.	Light.	150# load.	40# load.
E. Trombone pump.	Office of Blister-Burst Control direction - samples.	Double acting. Double acting.	Variable.	Fibre fibre damaged.	Medium.	150# load.	40# load.
	D. B. Smith Co. F. C. Brown Co.	Single acting. Double acting.	Difficult.	Extension tip, curved, on tip re-acted.	Heavy.	75# pressure.	50# pressure.
	R. D. Hulse. Wulley-Sprayer Co.	Double acting. Double acting.	Variable.	Valves - extension tip.	Medium.	200# pressure.	50# pressure.
F. Nozzles.	D. B. Smith Co. Wulley-Sprayer Co.	Pressed brass - golden spray, straight stream. Cast brass, 5/8 inch. Brass - 2 feet x 1/8 inch.	Variable.	Threads stripped.	Light.	75# pressure.	35# pressure.
G. Nozzle extensions for trombone pump.	D. B. Smith Co.	Iron - 2 feet x 1/4 inch pipe - 2 feet x 1/8 inch pipe - 3 feet x 1/8 inch pipe - 4 feet x 1/8 inch pipe.	Difficult.	Soldered ends gave out.	Light.	75# pressure.	35# pressure.
H. Compressed air pressure sprayer.	Utility Sprayer Co. Pacific Marine Supply Co.	Compressed air single chamber cylindrical - 2 gallons, air double chamber knapsack shape - 5 gallons. Compressed air two chamber cylindrical - 4 and 1 gallon. Metal frame, canvas cover.	Variable.	No check on pressure. Unable to carry. Faulty - reducing valve, clogged. Reducing valve - unable to carry.	Medium.	85# pressure.	200# small chamber, 50# large chamber.
I. Chemical mixing vat.	Office of Blister-Burst Control direction - samples.	Copper and sheet iron mesh rollers.	Variable.	Will not mesh.	Medium.	150# small chamber, 35# large chamber.	160# small chamber, 35# large chamber.
	Van Deusen Mfg. Co.		Easy.	OK.	Light.	150# load.	10# load.







a. Morro Bay, California tests (see Swanson's Report).

2. Development of new equipment suited to the needs of chemical eradication in the forests of the Northwest.

Aim - To build and assemble a light, strong, easily operated unit, dependent only on the activity and care of one man in the field, capable of doing an efficient spraying operation even on the most inaccessible areas.

3. Results - Description of units with reference to prints.

a. Pump.

Figures 1, 2 and 3 of the accompanying prints explain the working parts and the general appearance of the Brown pump manufactured by the E. C. Brown Company, Rochester, New York and rebuilt according to our direction before being sent into the field.

Examining the drawing it will be noted that the pump Fig. 1 has a cylindrical shape with a nozzle on extension mounting tip 22 and tail piece 3 as its two extremities. Packing nut 2 and tail piece 3 are threaded on barrel 4. Plunger 5 passes through packing nut 2 and is secured by ring 17 and pin 16 from injuring leather cup washer 8 when in operation. Graphite packing ring 19 held in place by stop ring 18 and packing nut 2 insures against leaking. Barrel 4 is indented just above where tail piece 3 is threaded to hold perforated stop washer 11 and leather sealing washer 12 in position, perforated stop washer 11's function, being, to hold the ball check above opening 13 in place. Plunger 5 has a rectangular opening 15 cut through the side of the copper tube, three of the edges being cut and the severed piece pressed to a right angle with the tube, this projection serving to hold the ball check above opening 14 in place. A threaded valve base 6 serves as a seat for the valve above opening 14. The leather cup 8 is held in position by a threaded seat 7 enlarged to add strength and support. Extension tip 22 was first soldered on plunger 5 but later removed and brazed according to our directions. Two close-fitting wooden handles 21 are soldered to the plunger and barrel by means of a thin copper sleeve attached at both ends. Both handles are the same size. All metal parts are brass.



8-2



## INDEX TO FIGURES

Operation of the pump - The course of the chemical fluid through the pump is as follows: On the outward (expansion) stroke of the plunger the liquid enters the ball check valve through opening 13 (14 closed by the automatic action of pressure) passes through the perforated stop washer 11 and fills the barrel 4. The expansion stroke continues until plunger stop ring 17 strikes packing stop ring 18. During this operation the liquid around plunger 5 is forced through the rectangular opening 15 by the action of the valve above opening 14 and cup washer 8. The liquid passes into the inside of the plunger and out through nozzle attached at 22. At the completion of the expansion stroke the barrel is completely filled with liquid. When the first impulse of a reverse action of the plunger takes place, the ball check valve above opening 13 closes, and the plunger displacement on the compression stroke forces the excess liquid in the barrel through the nozzle end. On the compression stroke the valve at 14 and the cup washer are both open, filling the upper chamber for the next succeeding stroke as well as allowing the excess fluid to flow out through the nozzle end of the pump.

FIG 6

FIG 7

FIG 8

FIG 9

FIG. 10

FIG. 11

FIG. 12



1. The first step is to remove the old sealant from the joint. This is done by using a putty knife to scrape out the old sealant. The joint should be cleaned thoroughly with a wire brush and then with a solvent to remove any remaining sealant or dirt. The joint should be allowed to dry completely before applying the new sealant.



# INDEX TO FIGURES

- FIG. 1 CROSS SECTION VIEW OF PUMP -  
WORKING PARTS
- FIG. 2 CROSS SECTION VIEW OF PUMP PLUNGER  
TIP - NOZZLE OR EXTENSION MOUNTING
- FIG. 3 PERSPECTIVE VIEW OF PUMP
- FIG. 4 TOP PLAN VIEW OF KNAPSACK TANK
- FIG. 5 PERSPECTIVE VIEW OF KNAPSACK TANK -  
BACKREST, LACING, AND PACK STRAPS SHOWN
- FIG. 6 PERSPECTIVE VIEW OF PACKBOARD AND  
TANK
- FIG. 7 TOP PLAN VIEW OF PACKBOARD AND TANK
- FIG. 8 FRONT PLAN VIEW OF PACKBOARD FRAME  
WITH PACK STRAPS ATTACHED
- FIG. 9 FRONT PLAN VIEW OF CANVAS COVER FOR  
PACKBOARD FRAME SHOWN IN FIG. 8
- FIG. 10 TOP PLAN VIEW OF PACKBOARD FRAME
- FIG. 11 SIDE PLAN VIEW OF TANK FOR PACKBOARD
- FIG. 12 REAR PLAN VIEW OF TANK FOR PACKBOARD







# PUMP

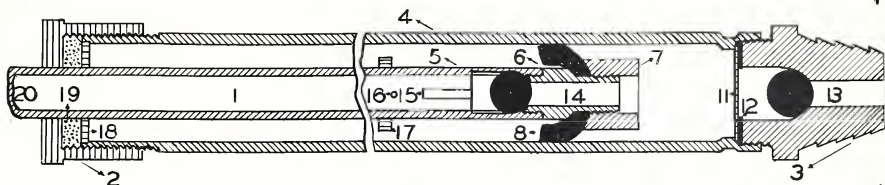


FIG. 1

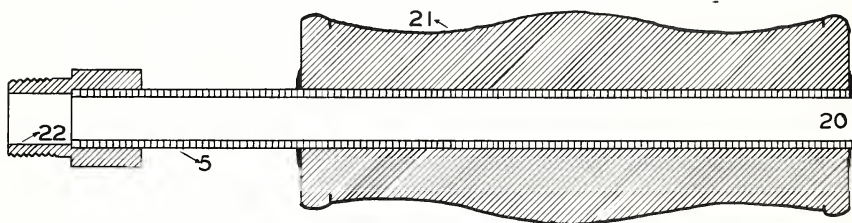


FIG. 2



FIG. 3







# KNAPSACK

## b. Knapsack.

Figures 4 and 5 show a top plan view and a perspective view (backrest, lacing, and pack straps indicated) of the knapsack constructed and used during the past field season by the Office of Blister-Rust Control. Tank 1 has a convex wall 2 and a concave wall 3 with top 4 and bottom 5. The concave wall has apertured extensions 6 adapted to receive laces 7. Lacing members 7 are also adapted to pass through screw eyes 8 in the flexible backrest 9 and support said backrest adjacent to the wall 3 of tank 1. Flaps 10 are secured at one edge 11 to the backrest and at the other edge 12 by means of screw eyes and cords 14 which are adapted to pass through the screw eyes 13 and the apertured extension 6. These flaps provide protection against roughness of lacing members 7. Shoulder straps 15 of conventional design are secured to tank 1 by suitable fastenings such as shown at 16.

Bottom 5 is attached to walls 2 and 3 by a double seam soldered on both the inside and outside. Top 4 is attached to walls 2 and 3 by a single seam soldered on the outside. Apertured extension 6 is five thicknesses of metal, with a double hem and dipped in solder to insure against leaking. Vertical inside struts are provided to give support to the side walls 2 and 3. Tank 1 is made of 26-gage galvanized sheet iron. Flexible backrest 9 is made of 12 ounce duck. Laces 7 are 1/4 inch latigo leather. The capacity of the tank is 5½ gallons.

Operation of the knapsack - One end of a 30 inch length 1/2 inch diameter garden hose is slipped over the tail piece of the Brown pump and clamped in place the other end is attached and clamped to the knapsack spigot. After the knapsack has been filled with liquid, the entire unit is placed on the back of an operator and properly adjusted. Both hands are free to operate the pump. Gravity feeds the chemical into the pump. A fine spray is produced by a moderate action of the plunger. The entire unit weighs approximately 60 lbs., when completely filled and ready for spraying. The entire unit empty weighs 13 lbs.

DRAWN BY G. J. C. 1918



[illegible]



# KNAPSACK

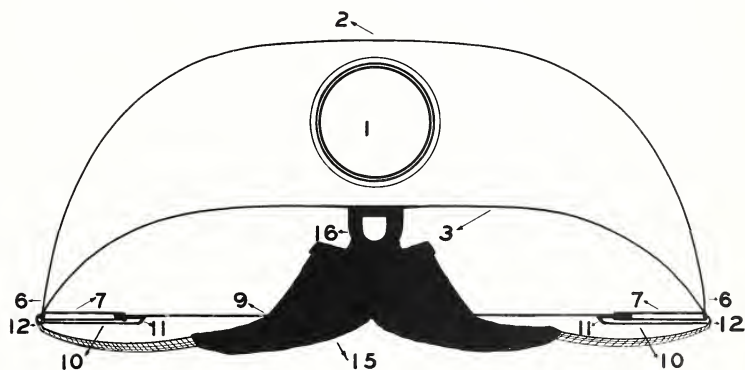


FIG. 4







# KNAPSACK

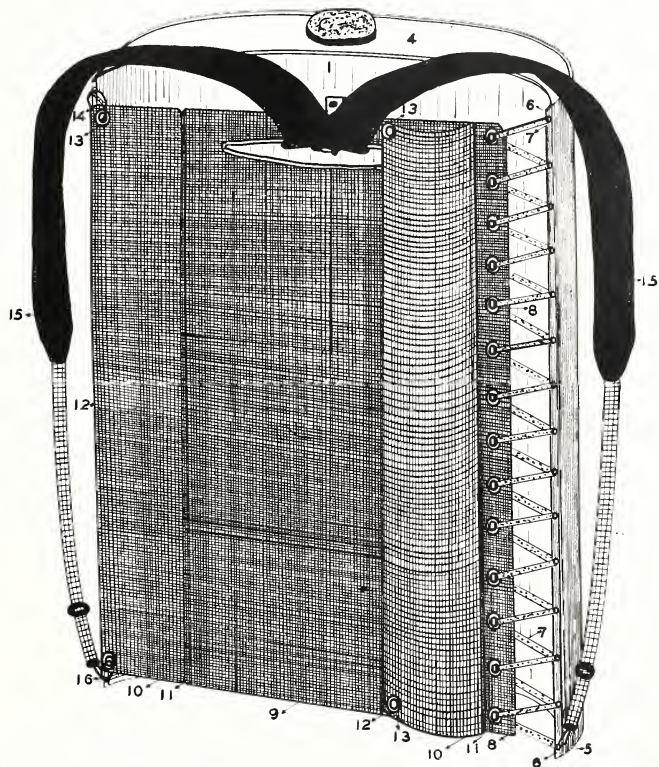


FIG. 5

DRAWN BY *John F. Beskey* OFFICE OF BLISTER-RUST CONTROL

12-4-29







# PACKBOARD AND TANK

## c. Packboard and tank.

Figures 6 and 7 show a top plan view and a perspective view of the packboard and tank, specifications determined and used during the past field season by the Office of Blister-Rust Control. The revised packframe is manufactured by the owners of the original packboard patents, the Charles Trager Company of Seattle, Washington.

Tank 1 is strapped on packboard 2 by means of leather straps 3 secured by D-ring and screw eye 4 and buckle 5, the upper strap going through strap-eye 6 to keep tank 1 in position. Spring oak bows 11 are morticed and attached with screws to spruce uprights 12. Canvas jacket shown as 7 and 8, outer extremities indicated, laced with cord 9 drawn through eyelets 10. Pack straps 13 are tacked to upper oak bow 11 at 17 and are drawn through canvas jacket 8 at 15, back through at 14 and fastened to a detachable hook at 16. The tank is filled at 18 and the solution is drawn out through spigot 19.

The bottom of the tank is fastened to the sides by a double seam, and soldered on both the inside and outside. The top is attached to sides by a single seam, soldered on the outside. Tank 1 is made of 26-gage galvanized sheet iron. The capacity of the tank is  $5\frac{1}{2}$  gallons.

The operation of this unit is the same as that of the knapsack with one exception. This unit is capable of a two-fold use - as a sprayer, and when the tank is removed, as a frame for carrying supplies to inaccessible regions. The entire sprayer, pump, hose, packboard and tank weighs  $12\frac{1}{4}$  lbs. when empty. The weight of the unit filled with chemical spray is approximately 60 lbs.

Figures 8, 9, 10, 11 and 12 show details in the assembly of the packboard and tank sprayer, packboard frame 1 indicating the means of attaching straps 3 on top of oak bow 5 at 2 and hooking same at the lower end by slipping square ring 9 over hook 4 on lower bow 7. The morticed joints with screws indicated are shown at 8. Strap adjustment buckles 10 are shown on straps 3. The canvas cover or jacket for packboard 11 has openings for straps at 13 and 14. Grammets or eyelets 12 are adapted for lacing cord when placed on frame 1.

FIG 7

DRAWN BY J. H. TRAGER, OFFICE OF BLISTER-RUST CONTROL



## 2. Packings and seals

Figures 8 and 9 show the top and bottom views of the packings and seals, respectively, installed in the test machine. The seal is made of a special material, and the packing is made of a special material. The seal is made of a special material, and the packing is made of a special material.

Figure 10 is a cross-section of the seal and packing. The seal is made of a special material, and the packing is made of a special material. The seal is made of a special material, and the packing is made of a special material.

The bottom of the seal is made of a special material, and the packing is made of a special material. The seal is made of a special material, and the packing is made of a special material.

The cross-section of the seal and packing is shown in Figure 11. The seal is made of a special material, and the packing is made of a special material. The seal is made of a special material, and the packing is made of a special material.

Figures 12, 13, 14, and 15 show details of the seal and packing. The seal is made of a special material, and the packing is made of a special material. The seal is made of a special material, and the packing is made of a special material.



# PACKBOARD AND TANK

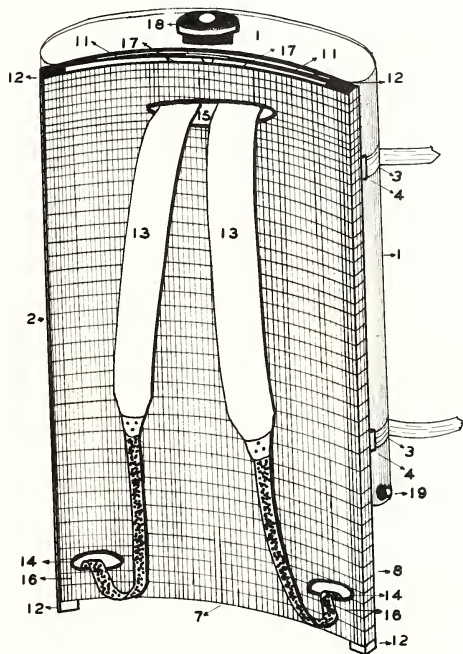


FIG. 6

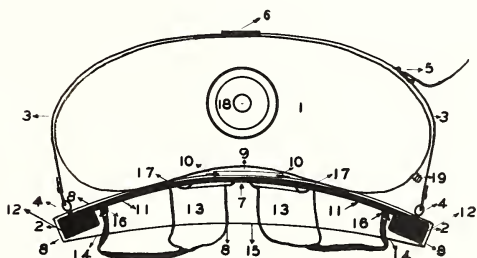


FIG. 7







# PACKBOARD AND TANK

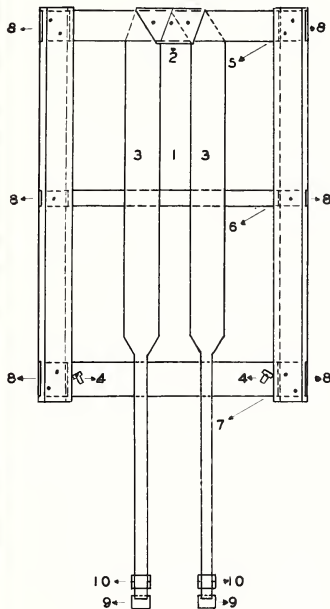


FIG. 8

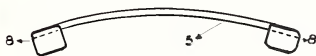


FIG. 10

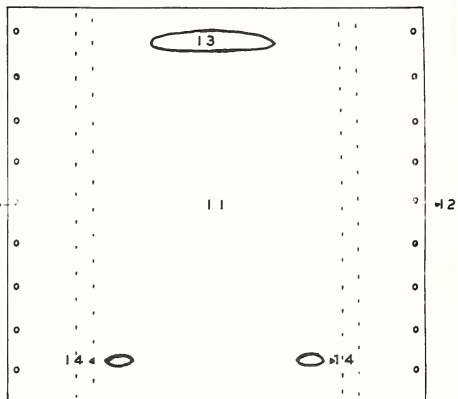


FIG. 9



FIG. 11

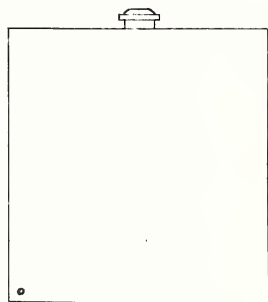


FIG. 12







TABLE NO. 2

## COST OF MANUFACTURE OF KNAPSACK SPRAYING UNIT

Cost of Knapsack											
	Tank	Pack-board	Canvas Backrest	Latigoes	Pack- straps	Filling Cap	Outlet Spigot	Leather Straps	Strap Hooks	Total Packboard Unit Cost	Total Knapsack Unit Cost
Improved Knapsack	\$2.65		\$ .97	\$ .30	\$ .70	\$ .32	\$ .25		\$ .34		\$ 5.53
packboard and Tank	\$1.95	\$3.00				\$ .32	\$ .25	\$ .54		\$ 6.06	
Cost of Pump											
	Brown Pump	2' Length	Utility Nozzle	Extension	Tip Re- pairs	Hose Washers	Hose Clamp	Hose Wires	Total Pump Cost		
	\$2.85	\$ .20	\$ .65	\$ .50	\$ .18	\$ .04	\$ .25	\$ .02	\$ 4.69	4.69	\$ 10.22
	Total cost of assembled spraying unit.										\$ 10.75

These figures are based on lot purchases of perfected field equipment and do not include experimental units built in the development of a suitable sprayer.







Up to this time the Western Office of Blister-Rust Control has purchased 122 Brown pumps, 64 knapsacks, 60 assembled packboards, 73 canvas backrests for knapsacks, 55 tanks for packboards, 144 packstraps, and latigoes, spigots, filling caps, etc., to fully equip same. This equipment was used during the 1929 field season.

Care of equipment - At the close of the field season all sprayers were disassembled, wooden parts were oiled and painted, canvas and leather goods washed and leather oiled, and the metal parts were given a bath in a weak solution of hydrochloric acid to remove oil, chemical spray residue and dirt from both the inside and the outside. The tanks were then painted.

#### RESULTS OF EXTENSIVE FIELD TESTS

Results of extensive field tests of both knapsack and packboard and tank show the following:

1. Both units have proven satisfactory as sprayers (a few minor faults were determined and changes are indicated in recommendations for 1930 which follow).

2. The packboard has the added advantage of being useful in transporting supplies to regions not easily reached by pack train or auto truck.

#### RECOMMENDATIONS

I. Use the packboard and tank as manufactured for 1929 field use, but with the following changes:

A. Put an angle iron seat for tank on packboard to hold tank in position.

B. Make a 30 to 35 degree bend in the outlet spigot to avoid hose breaking.

C. Provide the outlet with a shut-off valve.

D. Use short pieces of aluminum flexible tubing to supplement wire housings as they have proven inadequate.

E. Place a diagram of working parts of the pump and directions for upkeep in the hands of each crew foreman.

F. Make the canvas jacket of heavier material doubling the bottom 1/3.

G. Use bolt eyes to secure straps to packframe instead of screw eyes.

H. Have all wooden parts on new equipment oiled and painted before being sent into the field.

I. Provide pack straps of better quality.







II. Experiments to be carried out in testing new types of equipment and their adaptability to our work.

A. Build a 4-gallon tank in order to reduce the load.

B. Determine the kind of sheet metal most resistant to the chemical killing agents we are using, build sample tanks of this and put them in the field for extended tests. (The galvanized iron is attacked to some extent by chemicals.)

C. Plate with copper several of the galvanized iron tanks and put them in field for extended tests.

D. Build tank models of a lighter gage iron than now used with;

1. Struts for side strength.
2. Double seams for added strength.

E. Determine the merits of the grease packing gland for pump.

F. Build sample pack frames of aluminum tubing instead of wood which springs out of shape after continued use in connection with chemicals.

G. Secure all necessary information to assist us in either adapting or building a small portable chemical duster to use in applying chemical killing materials to wild Ribes when chemicals are mixed with a proper hygroscopic agent.

H. Build a new 2-way pump with the needs of our special job paramount.

1. Changes needed to make the pump fit our needs.
  - a. Reduce size of pump.
    - (1) Greater pressure per square inch per unit of pressure applied.
    - (2) Lighter in weight.
    - (3) More easily operated.
  - b. Faults in old makes removed.
    - (1) Reinforced nozzle tip.
    - (2) Larger packing gland.
    - (3) Larger valve opening.
    - (4) Heavier plunger stop rings pinned and soldered.

2. Reasons for building a special pump.



II. Instruments to be carried out in testing and types of equipment and their responsibility to the work.

- A. Build a 4-gallon tank in order to reduce the loss.
- B. Determine the kind of chemical which is used in the chemical killing process as the killing. This results in the use of the chemical in the field for extended tests. (The chemical from is attached to some extent by chemicals.)
- C. Place with enough material in the tank to cover the tanks and put them in field for extended tests.
- D. Build tank with a 4-gallon tank and from then on used with:

1. Build of side tank.
2. Build tank for water treatment.

3. Determine the results of the work in the field in pump.

4. Build tank with pump in order to determine the results of work which results out of work after treatment in connection with chemicals.

5. Secure all necessary information to make the work in the field or building a small portable chemical tank to use in the field and chemical killing material to kill the chemical in the field with a proper hygienic agent.

6. Build a new 4-gallon tank in the field of the work.

7. Change needed to make the work in the field.

8. Reduce size of pump.
- (1) Greater pressure in the pump in the field.
- of pressure applied.
- (2) Lighter in weight.
- (3) More easily carried.
9. Carries in the field in the field.
- (1) Reinforced material.
- (2) Larger pump in the field.
- (3) Larger pump in the field.
- (4) Larger pump in the field.
- (5) Larger pump in the field.
- soldered.

10. Reason for building a special pump.



772 *Stefan*

3. All pumps are too light to stand up under heavy duty for a long period of time.

- a. Remanufacture necessary before being sent into the field.

4. Object in building a new pump.
- a. To reduce the man power necessary to spray a unit.



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5. To remove the paper, insert the paper into the slot on the right side of the unit.

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## EXPERIMENTAL STREAM TYPE RE-ERADICATION

By  
Harry F. Geil,  
Agent.

### PURPOSES

1. To determine the number of bushes and feet of live stem missed or not killed per acre in original eradication, and the causes.
2. To determine the number of seedlings and sprouts reproduced per acre following original eradication.
3. To determine the relative cost of chemical and hand re-eradication of Ribes following original eradication with chemicals.
4. To determine the relative effectiveness of the six different spray solutions used on original eradication on this area.

### LOCATION AND DESCRIPTION OF AREA

#### A. Location

The area chosen for this operation was a portion of the East Fork of Potlatch Creek drainage, near Bovill, Idaho and lying within the east half of township 41 north, range 1 east, Boise Meridian.

This area was chosen because it was the only large area of stream type that had been eradicated of Ribes by the chemical method.

#### B. Description

The area was all stream type varying in width from one to ten chains.

### METHODS, EQUIPMENT AND MATERIAL

#### A. Method

1. The up-stream half of each block was sprayed by the knapsack spraying method and the lower half was hand pulled.
2. A count was made of the different species of seedlings, sprouts and bushes and the time and amount of spray required on each half of each area.

#### B. Equipment

The regulation knapsack spraying equipment consisting of the improved tank and double-action pump was used.



EXPERIMENTAL STUDY OF THE EFFECT OF

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INTRODUCTION

1. To determine the number of bushes and trees of each species not killed per acre in original vegetation, and the density.
2. To determine the number of seedlings and bushes per acre in some following original vegetation.
3. To determine the relative rate of increase of the number of bushes following original vegetation.
4. To determine the relative effect of the different spray solutions used on original vegetation on the growth.

LOCATION AND DESCRIPTION OF AREA

1. Location

The area chosen for this operation was a portion of the old fork of Potlatch Creek drainage, near the old town of Potlatch, east half of township 41 north, range 1 east, section 36, T41N, R1E, S36. This area was chosen because it was the only area of the stream type that had been indicated as being of the Potlatch type.

2. Description

The area was all stream type, varying in width from 10 to 100 feet, and was all stream type.

METHODS, EQUIPMENT AND MATERIALS

1. Method

1. The up-stream half of each block was sprayed by the spraying method and the lower half was hand pulled.
2. A count was made of the different species of seedlings, bushes and trees and the time and amount of work required on each half of each area.

2. Equipment

The regulation Knapsack sprayer, equipped with a 10 gallon improved tank and double-action pump was used.



### C. Material

A 10% solution of sodium chlorate plus calcium chloride was used until July 19 and a 10% solution of Atlacide was used for the remainder of the season. A glue spreader, 1/2 pint stock solution to 14 gallons of spray solution was used.

### WORK PERFORMED

In addition to the re-eradication of 219.3 acres, a protective strip totaling 113.2 acres was eradicated along the border of the 1928 eradicated area and also 4 acres of methods plots were re-worked, making a total area of 336.5 acres.

Since protection to pine and development of methods were not of major importance on this operation the tables, analyses, etc., following, deal only with re-eradication on the 6 blocks listed below:

#### Sprays Used in Eradication on the Different Blocks - 1928

#### Block No. Spray No.

II	II	25% NaClO <sub>3</sub> and whale oil spreader
IV	IV	20% NaClO <sub>3</sub>
V	V	20% NaClO <sub>3</sub> and whale oil spreader
VI	VI	9.6# NaClO <sub>3</sub> + 7.2# CaCl <sub>2</sub> + 9½ gallons water and 1 pint whale oil spreader
VII	VII	30% NaClO <sub>3</sub> and whale oil spreader
VIII	VIII	20# NaClO <sub>3</sub> + 15# CaCl <sub>2</sub> + 10 gallons water and 1/2 pint whale oil spreader

TABLE NO. 1.

#### DISTRIBUTION OF RIBES SEEDLINGS, SPROUTS AND OTHER BUSHES ON THE DIFFERENT BLOCKS.

Block No.	Acres	R i b e s			Total
		Seedlings	Sprouts	Other*	
II	40.0	3,560	4,435	2,950	10,945
IV	16.9	235	209	432	876
V	67.6	2,990	2,705	2,424	8,119
VI	28.0	43,647	3,923	11,499	59,071
VII	64.8	3,723	2,987	7,826	14,536
VIII	2.0	64	66	241	371
Total	219.3	54,221	14,325	25,372	93,918

\*Other Ribes includes bushes which survived original eradication whether missed or not killed by sprays used.







TABLE NO. 2.

DISTRIBUTION OF RIBES SEEDLINGS, SPROUTS AND OTHER BUSHES  
ON ALL BLOCKS COMBINED.

Ribes	Totals	Total Per Acre	Per Cent of Total
Seedlings	54,221	247.2	58
Sprouts	14,325	65.3	15
Others	25,372	115.7	27
Totals	93,918	428.2	100

TABLE NO. 3.

NUMBER OF ACRES, RIBES OF EACH SPECIES, MAN-DAYS AND RIBES PER ACRE ON EACH  
BLOCK.

Block No.	Acres	Man- Days	R. lac.	R. pet.	R. iner.	R. visco.	Totals	Per Acre
II	40.0	35.88	5,914	3,721	1,268	42	10,945	273.6
IV	16.9	11.63	457	391	28	0	876	51.8
V	67.6	45.50	3,277	3,735	507	0	8,119	194.0
VI	28.0	67.50	5,449	49,799	3,823	0	59,071	2,109.6
VII	64.8	57.87	6,310	2,332	5,385	9	14,536	224.2
VIII	2.0	1.62	242	74	55	0	371	185.5
Totals & Averages	219.3	220.00	22,249	60,552	11,066	51	93,918	428.2



1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

Hotels	85.214	400.0	100.0
Cabana	11.470	11.7	10.0
Sportha	14.508	8.1	11.0
Bandiliga	54.281	54.1	10.0
Ribes	100.000	100.0	100.0

1954



TABLE NO. 4.

SPROUTS AND BUSHES FOUND ON DIFFERENT BLOCKS SHOWING RELATIVE EFFECTIVENESS OF VARIOUS SPRAYS USED ON ORIGINAL ERADICATION.

Block No.	Acres	Sprouts*		Others**		Total
		Total	Per Acre	Total	Per Acre	Per Acre
II	40.0	4,435	110.9	2,950	73.7	184.6
IV	16.9	209	12.4	432	25.6	38.0
V	67.6	2,705	40.0	2,424	35.8	75.8
VI	28.0	3,923	140.0	11,499	410.7	550.7
VII	64.8	2,987	46.1	7,826	120.8	166.8
VIII	2.0	66	33.0	241	120.5	153.5
Totals & Averages	219.3	14,325	65.3	25,372	115.7	181.0

\*New growth from an old root is called a sprout.

Assuming the Ribes stand on the different areas to have been equal before eradication Table No. 4 clearly shows spray No. IV to be the most effective and spray No. VI the least effective.

TABLE NO. 5.

R. PETIOLARE SPROUTS AND BUSHES FOUND ON DIFFERENT BLOCKS TO SHOW RELATIVE EFFECTIVENESS OF VARIOUS SPRAYS USED ON ORIGINAL ERADICATION ON R. PETIOLARE

Block No.	Acres	Sprouts		** Others		Total
		Total	Per Acre	Total	Per Acre	Per Acre
II	40.0	1,479	36.9	499	12.5	49.4
IV	16.9	134	7.9	96	5.7	13.6
V	67.6	814	12.0	682	10.1	22.3
VI	28.0	3,449	123.2	5,181	185.0	308.2
VII	64.8	182	2.8	840	13.0	15.8
VIII	2.0	6	3.0	49	24.5	27.5
Totals & Averages	219.3	6,064	27.6	7,347	33.5	61.1

\*\* Seedlings not included in Tables 4 and 5 because they germinated since 1928 Ribes eradication was done and have no bearing on the toxic action of sprays used on Ribes bushes in 1928.



TABLE NO. 2.

PROBES AND BUSHES FOUND ON DIFFERENT RIBES SPECIES IN 1928  
OF VARIOUS SPRAYS USED ON ORIGINAL PLANTATION.

Block No.	Acres	Total for Area	Sprayed	Total for Area	Not Sprayed
II	40.0	1,479	1,479	1,479	1,479
IV	16.8	134	134	134	134
V	87.6	876	876	876	876
VI	28.0	1,479	1,479	1,479	1,479
VII	84.8	1,479	1,479	1,479	1,479
VIII	2.0	8	8	8	8
Totals & Averages	219.2	14,792	14,792	14,792	14,792

\*New growth from an old root is called a root.

As shown the Ribes stems on the different areas to have been equal before eradication Table No. 4 clearly shows spray No. IV to be the most effective and spray No. VI the least effective.

TABLE NO. 3.

R. PATIENCE'S PROBES AND BUSHES FOUND ON DIFFERENT RIBES SPECIES IN 1928  
EFFECTIVENESS OF VARIOUS SPRAYS USED ON ORIGINAL PLANTATION OF R. PATIENCE

Block No.	Acres	Total for Area	Sprayed	Total for Area	Not Sprayed
II	40.0	1,479	1,479	1,479	1,479
IV	16.8	134	134	134	134
V	87.6	876	876	876	876
VI	28.0	1,479	1,479	1,479	1,479
VII	84.8	1,479	1,479	1,479	1,479
VIII	2.0	8	8	8	8
Totals & Averages	219.2	14,792	14,792	14,792	14,792

\*\*Seedlings not included in Tables 4 and 5 because they were not included in 1928 Ribes eradication was none and have no bearing on the table of sprays used on Ribes bushes in 1928.



Using data on R. petiolare only Table No. 5 gives the same efficiency results as Table No. 4, that is, spray No. IV is the most effective and spray No. VI the least effective.

TABLE NO. 6.

NUMBER OF FEET OF LIVE STEM SURVIVING ON DIFFERENT BLOCKS AND FEET PER ACRE. OLD BUSHES SURVIVING ORIGINAL ERADICATION ONLY.

Block No.	Acres	<u>R. lacustre</u>		<u>R. petiolare</u>		<u>R. inerme</u>		Total Feet Live Stem Per Acre
		Total	Per Acre	Total	Per Acre	Total	Per Acre	
II	40.0	9,556	239	5,226	131	18,778	469	839
IV	16.9	1,406	83	506	30	137	8	121
V	67.6	7,003	104	4,114	61	1,227	18	183
VI	28.0	39,203	1,400	67,742	2,419	44,217	1,579	5,398
VII	64.8	11,096	171	7,165	110	70,292	1,085	1,366
VIII	2.0	848	424	254	127	343	171	722
Totals & Averages	219.3	69,142	315	85,007	387	134,994	615	1,318

Using the number of feet of live stem, Table No. 6 shows the same relative effectiveness as Tables No. 4 and No. 5. Therefore, it is evident that spray No. IV was the most effective of the six used.

#### DISCUSSION AND ANALYSIS

An analysis of Tables No. 1 and 2 shows that seedlings come in the first year after eradication in great numbers. A total of 58% of all Ribes recorded being seedlings, 27% surviving bushes, and 15% sprouts.

87% of the seedlings were R. petiolare, 11% R. lacustre and 2% R. inerme. The seedlings were distributed quite generally over the area while the sprouts were confined more to the lower ground near the stream,

The reasons for the ineffectiveness of spray No. 6 are stated by H. R. Offord (in charge of chemical investigations being conducted by Western Office of Elister-Rust Control) as follows:



Calculated on H. Isolatus only, Table No. 2 gives the efficiency results as Table No. 4, that is, that no. 1 is the most effective and spray no. VI the least effective.

TABLE No. 4.

NUMBER OF FEET OF LIVE STEAM SURVIVING ON 1000 YARDS ONLY  
AFTER ONE HOURS SURVIVING ON 1000 YARDS ONLY

Block No.	Acres	Total	Per acre	Per Total	Per 1000	Per 1000	Per 1000
I	40.0	5,338	133.45	1,111.67	1,111.67	1,111.67	1,111.67
II	16.0	1,408	88.00	744.44	744.44	744.44	744.44
III	32.0	7,003	218.84	1,818.75	1,818.75	1,818.75	1,818.75
IV	28.0	35,303	1,260.82	10,506.83	10,506.83	10,506.83	10,506.83
V	64.8	17,093	263.78	2,190.24	2,190.24	2,190.24	2,190.24
VI	8.0	348	43.50	362.50	362.50	362.50	362.50
VII	28.0	62,442	2,230.07	18,583.92	18,583.92	18,583.92	18,583.92
VIII	28.0	62,442	2,230.07	18,583.92	18,583.92	18,583.92	18,583.92
Average	28.0	62,442	2,230.07	18,583.92	18,583.92	18,583.92	18,583.92

Using the number of feet of live steam, Table No. 4 shows the same relative effectiveness as Table No. 1 and No. 2. Therefore, it is evident that spray No. IV was the most effective of the four used.

### DISCUSSION AND CONCLUSIONS

An analysis of Tables No. 1 and 2 shows that seedlings were in the first year after eradication in great numbers. A total of 82% of all pipes recorded during seedlings, 37% surviving, 45% and 13% surviving.

82% of the seedlings were H. Isolatus, 11% H. Isolatus, 3% H. Isolatus. The seedlings were distributed quite evenly over the area while the sprouts were confined more to the lower ground near the stream.

The reasons for the ineffectiveness of spray No. 1 and 2 are as follows: by H. A. O'Brien (in charge of chemical investigations) and controlled by Western Office of Aircraft Control, as follows:



"For the most part the results confirm our earlier observations regarding the comparative toxicity of sodium chlorate and sodium chlorate plus calcium chloride. It is most likely that the poor results obtained with spray No. VI are due to the following reasons: (1) presence of the hygroscopic agent  $\text{CaCl}_2$ , (2) alkaline solution, the pH of the spray must have been around 10 since it was not properly adjusted, (3) the lateness of the season, (4) combination of the first three undesirable factors with the dilute solution. I would, of course, expect best results from No. IV which contained sodium chlorate alone at about the proper pH. If you compare No. VI with No. VIII it is apparent that the amount of  $\text{CaCl}_2$ , since it is inhibitory in its action, is important. No. VI formulae contains more  $\text{CaCl}_2$  proportionately than does spray No. VIII. Spray No. VIII, of course, contained more sodium chlorate, but aside from that the presence of  $\text{CaCl}_2$  shows up as an inhibitor.

"Spray No. VI is very close to the mixture that we used before the Atlacide arrived and moreover corresponds rather closely to the proportions of sodium chlorate and calcium chloride in the Atlacide. There is one important difference, however, and that is the pH value of the sprays which we used this past summer are on the right side of the wire and I expect better results. However, when we use the calcium chloride, as I have previously pointed out, we must content ourselves with a lower percentage of kill than we would obtain by using the sodium chlorate alone."

TABLE NO. 7.

DISTRIBUTION OF RIBES SEEDLINGS, SPROUTS AND OTHERS BY SPECIES.

Species	Seedlings		Sprouts		Others	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
<i>R. petiolare</i>	47,141	77.9	6,064	10.0	7,347	12.1
<i>R. lacustre</i>	6,041	27.0	7,051	32.0	9,157	41.0
<i>R. inerme</i>	1,028	9.0	1,195	11.0	8,343	80.0
<i>R. viscosissimum</i>	11	21.5	15	29.5	25	49.0
Totals & Averages	54,221	57.7	14,325	15.3	25,372	27.0



"For the most part the results confirm our earlier observations regarding the comparative toxicity of sodium chlorate and calcium chlorate plus calcium chloride. It is most likely that the good results obtained with spray No. VI are due to the following reasons: (1) presence of the hygroscopic agent Calcium Chloride in the solution, the pH of the spray must have been around 10 since it was not very high, (2) the fatness of the season, (4) (4) the fatness of the season, three undetectable factors with the dilute solution. I would, of course, expect best results from No. IV which contains sodium chlorate alone as about the proper pH. If you compare No. VI with No. VIII it is apparent that the amount of Calcium Chloride in its solution, is important. No. VI formula contains more Calcium Chloride than does spray No. VIII. Spray No. VIII, of course, contained more sodium chlorate, but aside from that the presence of Calcium Chloride alone is not

"Spray No. VI is very close to the formula that we had before the chloride arrived and moreover corresponds to the closest proportions of sodium chlorate and calcium chloride in the literature. There is one important difference, however, the fact that the pH of the spray which we used this year was on the high side of the wire and I expect better results. However, when we use calcium chloride, as I have previously pointed out, we must contend ourselves with a lower percentage of kill than we would expect by using the sodium chlorate alone."

TABLE NO. 7.

DISTRIBUTION OF RIBES SUMMITRIS, 1935, AND OTHER DATA

Species	Number Count	Number Count	Number Count	Number Count
R. petiolare	27,141	27.5	6,384	10.0
R. fasciata	6,441	27.0	7,251	28.0
R. integrum	1,023	2.0	1,103	11.0
R. viscosissimum	11	21.5	10	20.0
Totals & Average	34,615	37.0	14,748	15.0



The striking feature of Table No. 7 is the distribution of seedlings. Four-fifths of all seedlings were R. petiolare with R. inerme falling below R. lacustre. R. inerme is low in reproduction of seedlings and sprouts on the area worked.

TABLE NO. 8.

DISTRIBUTION OF RIBES SEEDLINGS, SPROUTS AND OTHERS BY BLOCKS.

Block No.	Seedlings		Sprouts		Others	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
II	3,560	32.5	4,435	40.5	2,950	27.0
IV	235	26.8	209	23.9	432	49.3
V	2,990	36.8	2,705	33.4	2,424	29.8
VI	43,649	73.9	3,923	6.6	11,449	19.5
VII	3,723	25.7	2,987	20.5	7,826	53.8
VIII	64	17.3	66	17.8	241	64.9
Totals	54,231	-	14,325	-	25,372	-

Block No. VI upon which eradication efficiency was lowest, shows the greatest reproduction of seedlings.

STATEMENT AND ANALYSIS OF COSTS.

TABLE NO. 9.

DISTRIBUTION OF COSTS.

I t e m	Cost	Per Cent
Salaries	\$1,712.62	58.6
Subsistence	752.82	25.6
Equipment	118.16	4.5
Chemical	138.14	4.6
Transportation of men	123.15	4.2
Miscellaneous	78.94	2.5
Totals	\$2,921.83	100.0



The striking feature of Table No. V is the small number of seedlings. Four of the 11 seedlings were *A. latifolia* and 7 were *A. latifolia*. The number is low in proportion of seedlings falling below 1. lactare. The number is low in proportion of seedlings and sprouts on the area covered.

TABLE No. 5.

DISTRIBUTION OF HIPPOCAMPUS, SPROUTS AND SEEDLINGS OF HIPPOCAMPUS

Block No.	No. of Sprouts	No. of Seedlings	No. of Sprouts	No. of Seedlings
I	4,450	4,450	4,450	4,450
II	4,450	4,450	4,450	4,450
III	4,450	4,450	4,450	4,450
IV	4,450	4,450	4,450	4,450
V	4,450	4,450	4,450	4,450
VI	4,450	4,450	4,450	4,450
VII	4,450	4,450	4,450	4,450
VIII	4,450	4,450	4,450	4,450
Total	4,450	4,450	4,450	4,450

Block No. VI shows the greatest reproduction of seedlings. It shows the greatest reproduction of seedlings.

TABLE No. 6.

DISTRIBUTION OF SEEDLINGS

Block No.	No. of Seedlings	No. of Sprouts	No. of Seedlings	No. of Sprouts
I	4,450	4,450	4,450	4,450
II	4,450	4,450	4,450	4,450
III	4,450	4,450	4,450	4,450
IV	4,450	4,450	4,450	4,450
V	4,450	4,450	4,450	4,450
VI	4,450	4,450	4,450	4,450
VII	4,450	4,450	4,450	4,450
VIII	4,450	4,450	4,450	4,450
Total	4,450	4,450	4,450	4,450



TABLE NO. 10.

COST OF RE-ERADICATION ONLY.

P r o j e c t	Acres	Total Cost	Cost Per Acre	Man-Days	Cost Per Man-Day
Re-eradication	219.3	\$1,690.42	\$7.72	220	\$7.68

TABLE NO. 11.

COMPARATIVE COST OF HAND AND CHEMICAL RE-ERADICATION

Method	Acres	Man-Days	Cost Excluding Chemical and Spray Equipment	Cost of Spray Equipment and Chemical	Total Cost	Per Acre
Hand	123.7	115.62	\$ 809.37		\$ 809.37	\$6.54
Chemical	95.6	104.38	730.63	\$150.42	881.05	9.22
Totals & Averages	219.3	220.00	\$1,540.00	\$150.42	\$1,690.42	\$7.71

The above table shows that it cost less to re-eradicate by hand than by chemicals.

The difference between the cost as shown by Tables No. 9 and 10, \$1,231.41, is accounted for by the fact that Table No. 10 is for re-eradication only while Table No. 9 includes the cost of extra eradication, of working methods plots and the salary and expenses of one man for recorder. On a practical job this recorder would not be used, hence his cost was not included against the job.

SUMMARY

An analysis of all tables leads to the conclusion that *Ribes* seedlings come in after chemical eradication in great profusion.

In the reproduction of *Ribes* seedlings, *R. petiolare* is first, *R. lacustre* second and *R. inerme* third.

In the reproduction of sprouts, *R. lacustre* is first, *R. petiolare* second and *R. inerme* third.

Of the sprays used on eradication No. IV was the most effective. The cost per acre for re-eradication was less by hand than by chemicals.



• 1957-1958-1959-1960-1961-1962-1963-1964-1965-1966-1967-1968-1969-1970-1971-1972-1973-1974-1975-1976-1977-1978-1979-1980-1981-1982-1983-1984-1985-1986-1987-1988-1989-1990-1991-1992-1993-1994-1995-1996-1997-1998-1999-2000-2001-2002-2003-2004-2005-2006-2007-2008-2009-2010-2011-2012-2013-2014-2015-2016-2017-2018-2019-2020-2021-2022-2023-2024-2025-2026-2027-2028-2029-2030-2031-2032-2033-2034-2035-2036-2037-2038-2039-2040-2041-2042-2043-2044-2045-2046-2047-2048-2049-2050-2051-2052-2053-2054-2055-2056-2057-2058-2059-2060-2061-2062-2063-2064-2065-2066-2067-2068-2069-2070-2071-2072-2073-2074-2075-2076-2077-2078-2079-2080-2081-2082-2083-2084-2085-2086-2087-2088-2089-2090-2091-2092-2093-2094-2095-2096-2097-2098-2099-2100-2101-2102-2103-2104-2105-2106-2107-2108-2109-2110-2111-2112-2113-2114-2115-2116-2117-2118-2119-2120-2121-2122-2123-2124-2125-2126-2127-2128-2129-2130-2131-2132-2133-2134-2135-2136-2137-2138-2139-2140-2141-2142-2143-2144-2145-2146-2147-2148-2149-2150-2151-2152-2153-2154-2155-2156-2157-2158-2159-2160-2161-2162-2163-2164-2165-2166-2167-2168-2169-2170-2171-2172-2173-2174-2175-2176-2177-2178-2179-2180-2181-2182-2183-2184-2185-2186-2187-2188-2189-2190-2191-2192-2193-2194-2195-2196-2197-2198-2199-2200-2201-2202-2203-2204-2205-2206-2207-2208-2209-2210-2211-2212-2213-2214-2215-2216-2217-2218-2219-2220-2221-2222-2223-2224-2225-2226-2227-2228-2229-2230-2231-2232-2233-2234-2235-2236-2237-2238-2239-2240-2241-2242-2243-2244-2245-2246-2247-2248-2249-2250-2251-2252-2253-2254-2255-2256-2257-2258-2259-2260-2261-2262-2263-2264-2265-2266-2267-2268-2269-2270-2271-2272-2273-2274-2275-2276-2277-2278-2279-2280-2281-2282-2283-2284-2285-2286-2287-2288-2289-2290-2291-2292-2293-2294-2295-2296-2297-2298-2299-2300-2301-2302-2303-2304-2305-2306-2307-2308-2309-2310-2311-2312-2313-2314-2315-2316-2317-2318-2319-2320-2321-2322-2323-2324-2325-2326-2327-2328-2329-2330-2331-2332-2333-2334-2335-2336-2337-2338-2339-2340-2341-2342-2343-2344-2345-2346-2347-2348-2349-2350-2351-2352-2353-2354-2355-2356-2357-2358-2359-2360-2361-2362-2363-2364-2365-2366-2367-2368-2369-2370-2371-2372-2373-2374-2375-2376-2377-2378-2379-2380-2381-2382-2383-2384-2385-2386-2387-2388-2389-2390-2391-2392-2393-2394-2395-2396-2397-2398-2399-2400-2401-2402-2403-2404-2405-2406-2407-2408-2409-2410-2411-2412-2413-2414-2415-2416-2417-2418-2419-2420-2421-2422-2423-2424-2425-2426-2427-2428-2429-2430-2431-2432-2433-2434-2435-2436-2437-2438-2439-2440-2441-2442-2443-2444-2445-2446-2447-2448-2449-2450-2451-2452-2453-2454-2455-2456-2457-2458-2459-2460-2461-2462-2463-2464-2465-2466-2467-2468-2469-2470-2471-2472-2473-2474-2475-2476-2477-2478-2479-2480-2481-2482-2483-2484-2485-2486-2487-2488-2489-2490-2491-2492-2493-2494-2495-2496-2497-2498-2499-2500-2501-2502-2503-2504-2505-2506-2507-2508-2509-2510-2511-2512-2513-2514-2515-2516-2517-2518-2519-2520-2521-2522-2523-2524-2525-2526-2527-2528-2529-2530-2531-2532-2533-2534-2535-2536-2537-2538-2539-2540-2541-2542-2543-2544-2545-2546-2547-2548-2549-2550-2551-2552-2553-2554-2555-2556-2557-2558-2559-2560-2561-2562-2563-2564-2565-2566-2567-2568-2569-2570-2571-2572-2573-2574-2575-2576-2577-2578-2579-2580-2581-2582-2583-2584-2585-2586-2587-2588-2589-2590-2591-2592-2593-2594-2595-2596-2597-2598-2599-2600-2601-2602-2603-2604-2605-2606-2607-2608-2609-2610-2611-2612-2613-2614-2615-2616-2617-2618-2619-2620-2621-2622-2623-2624-2625-2626-2627-2628-2629-2630-2631-2632-2633-2634-2635-2636-2637-2638-2639-2640-2641-2642-2643-2644-2645-2646-2647-2648-2649-2650-2651-2652-2653-2654-2655-2656-2657-2658-2659-2660-2661-2662-2663-2664-2665-2666-2667-2668-2669-2670-2671-2672-2673-2674-2675-2676-2677-2678-2679-2680-2681-2682-2683-2684-2685-2686-2687-2688-2689-2690-2691-2692-2693-2694-2695-2696-2697-2698-2699-2700-2701-2702-2703-2704-2705-2706-2707-2708-2709-2710-2711-2712-2713-2714-2715-2716-2717-2718-2719-2720-2721-2722-2723-2724-2725-2726-2727-2728-2729-2730-2731-2732-2733-2734-2735-2736-2737-2738-2739-2740-2741-2742-2743-2744-2745-2746-2747-2748-2749-2750-2751-2752-2753-2754-2755-2756-2757-2758-2759-2760-2761-2762-2763-2764-2765-2766-2767-2768-2769-2770-2771-2772-2773-2774-27

[illegible]

COMPARATIVE COST OF LIVING IN CHINA 1935-1945

[illegible]

The above table shows that if the following conditions are satisfied:

The difference between the cost of the two methods is \$1,000.00. This is accounted for by the fact that the cost of the two methods is \$1,000.00. This is accounted for by the fact that the cost of the two methods is \$1,000.00.

Y. H. H. T.

An analysis of all studies is to be conducted in the near future. The results of this analysis will be reported in a separate report.



RE-ERADICATION OF RIBES BY HAND-PULLING  
METHODS, IDAHO, 1929

Field Supervision by C. O. Peterson  
Report by C. C. Strong

INTRODUCTION

In 1928 re-eradication was conducted on an area where fewer Ribes bushes per acre were found by original eradication crews than for any other area worked during the period 1924-1929. For this reason the results obtained could be only locally applied. In order to secure information which might be applied to those regions having a high original Ribes population the decision was made to conduct the 1929 experiments on the area drained by the Little North Fork of the Coeur d'Alene River centering around Honeysuckle Ranger Station on the Coeur d'Alene National Forest. A large part of the area was originally eradicated of Ribes in 1927. The background for re-eradication experiments is set forth in the "1928 Annual Report of the Western Office" and will not be repeated here.

PURPOSES OF EXPERIMENT

1. To determine the average cost per acre for first re-eradication of Ribes in various eradication types.
2. To determine, on a large scale, the approximate protection afforded an area in terms of amount of Ribes left, the species, location of bushes and extent and character of Ribes reproduction following original eradication.
3. To determine what eradication types are adequately protected by one eradication of Ribes.
4. To determine the growth and survival of the numerous Ribes which germinate along chutes and skidways for varying periods following logging.

AREA ON WHICH WORK WAS DONE

Any one of the five camp areas worked in 1927, with the exception of the Cascade Creek drainage where no cut-over land was included, was satisfactory for re-eradication purposes. Hence,



RE-ERADICATION OF WHITE PINE  
WATKINS, 1937

Field Supervisor by C. C. Watkins  
Report by C. C. Watkins

INTRODUCTION

In 1938 re-eradication was undertaken on an area of 1000 acres in the White Pine National Forest. This area was located in the northwestern corner of the State of Idaho, and was bounded on the north by the Canadian border. For this reason the results obtained could be of considerable value. In order to secure information about the condition of those regions having a high percentage of white pine, it was decided to conduct the 1938 eradication on the same area as in 1937. North of the Great Salt Lake, near the town of Panguitch, Utah, is the Great Salt Lake. The area was divided into three sections. The first section was the area of the Great Salt Lake. The second section was the area of the Great Salt Lake. The third section was the area of the Great Salt Lake. The results of the eradication were as follows:

PROPOSED RE-ERADICATION

1. To determine the average age of the trees in various sections of the area.
2. To determine, on a large scale, the amount of white pine in the area in terms of volume of timber, the number of trees, the extent and character of the reproduction.
3. To determine what eradication steps are necessary to be taken by one eradication of white pine.
4. To determine the growth and survival of the immature trees which germinate along canyons and ridges in the area.

RESULTS OF THE RE-ERADICATION

Any one of the five cases which were reported in 1937, and which were the result of the Great Salt Lake, were included, was satisfactory for re-eradication. The results of the eradication were as follows:



the most accessible one, Skookum Creek, was chosen. Another reason for choosing this area was that one block of the Sand Creek area could be reached conveniently from the camp site selected. Furthermore a 1917 cutting which was not eradicated of Ribes, adjoined the Skookum Creek area and it was possible to secure from it considerable information regarding the Ribes growth and survival along the chutes and skidways.

#### METHODS OF WORKING

Crew methods employed were according to the best standards previously developed for the varying conditions encountered. Blocks as originally worked in 1927 were re-worked. Comparative data are shown under results.

Two special studies were made; (1) to determine the feasibility of spraying heavy concentrations of Ribes inerme so prevalent along the Little North Fork of the Coeur d'Alene River, and (2) to determine the feasibility of spraying R. viscosissimum and R. lacustre seedlings where they exist in such profusion as to make hand pulling impractical.

The re-eradication unit consisted of 14 men including the field supervisor.

#### RESULTS OF WORK

##### Hand Eradication.

Four blocks in the Skookum Creek area and one block in the Sand Creek area which were completely covered in 1927 were re-eradicated of Ribes in 1929. Table No. 1 shows the results of work done on these blocks. It will be noted that data are shown on a comparative basis, the 1927 results being contrasted with those of 1929.







TABLE NO. 1

COMPARATIVE RESULTS OF RIBES ERADICATION IN 1927 AND RIBES  
RE-ERADICATION IN 1928

Eradication Type	Ribes Pulled Re-eradication 1929				Total		Ribes Pulled 1927		Live Stem Per Acre		Man-Days		Cost Per Acre	
	Acres	Seed- lings	Sprouts	Others	Number	Per Acre	Number	No. Per Acre	1929	1927	1929	1927	1929	1927
Stream	193.7	7,995	1,094	3,946	13,035	67.3	109,929	557.5	123	11,360	88.32	465.55	\$2.71	\$14.53
D.M.	146.5	9	10	22	41	0.3	1,486	10.1	2	312	5.43	12.42	.23	.52
O.M.	1,532.2	6,136	376	2,340	8,852	5.4	76,864	48.3	47	676	92.23	341.45	.34	1.34
D.P.	445.5	1,198	133	409	1,740	3.9	29,912	67.1	12	872	29.47	59.95	.40	.81
O.P.	153.9	1,468	6	52	1,526	9.9	11,936	77.6	3	388	12.43	43.34	.48	1.67
D.R.	494.0	20	17	57	104	0.2	10,844	22.0	59	330	8.62	103.50	.11	1.33
O.R.	80.0	1,014	47	691	1,752	21.9	12,639	158.0	43	1,738	20.55	81.91	1.55	6.11
C.O.	1,554.0	171,540	854	6,909	179,303	115.4	621,822	400.1	43	3,200	205.55	801.38	.78	2.93
All	4,699.8	189,380	2,537	14,436	206,353	43.9	875,432	186.3	46	2,794	462.60	1,909.50	\$ .59	\$ 2.41







Of the total number of Ribes pulled in 1929 by re-eradication crews 92% were seedlings, 1% were sprouts and 7% were bushes missed by original eradication crews in 1927.

In addition to the re-eradication work done as shown in Table No. 1 certain areas adjoining not worked in 1927 were completed in 1929. The results of this original Ribes eradication are shown in Table No. 2.

TABLE NO. 2

ORIGINAL ERADICATION DONE IN 1929

Eradication Type	Acres	Number Ribes Pulled				Live Stem		Man-days		Cost
		R. lac.	R. vis.	R. iner.	Per Acre	Total	Per Acre	Total	Per Acre	Per Acre
Stream	4.6	484	1	153	139	10,572	2,300	5.5	1.20	\$7.82
C.C.	46.0	540	12,691		288	625	14	5.5	.12	.78
C.M.	100.0	4,615	52		47	220,852	2,209	50.1	.50	3.23
C.P.	43.0	499	38		12	52,168	1,199	3.5	.08	.53
Average					99		1,470		.33	\$2.17
or Total	193.6	6,138	12,782	153		284,217		64.6		

Studies of the growth and survival of Ribes along chutes and skidways were confined to two areas on which logging took place in 1917 and 1926 respectively. The areas chosen were fairly representative respectively of other areas having been logged for the same periods as determined by experience and numerous examinations of logged over areas in the general region. Table No. 3 shows the results of two studies made.

TABLE NO. 3

RESULTS OF ERADICATING RIBES ALONG CHUTES AND SKIDWAYS

Year of Logging	Acres Worked	Ribes Pulled		L. S. Destroyed		Average Size Bushes Pulled	Man-days	
		Number	Per Acre	Total Feet	Feet Per Acre		Total	Per Acre
1917	9	5,280	587	87,205	9,690	16.5	15.75	1.75
1926	4	3,057	764	255	64	.1	3.43	.86







Logical deductions to be made from the experiment are as follows:

1. Although germination of *Ribes* seeds on the 1926 cut-over area had apparently ceased (no bushes were found of 1929 germination) most of the bushes having germinated in 1928 and some of those having germinated earlier were so small that too many are missed. Eradication the fourth year following logging and brush disposal would no doubt be feasible.

2. Amount of *Ribes* live stem per acre is so small that eradication could be delayed to the fourth or fifth year without danger of great volumes of sporidia being produced on the leaves of *Ribes* seedlings.

3. Although there were fewer *Ribes* per acre on a twelve year cutting the bushes were of such size and difficulty of working so great that the average cost of working per acre was much greater than on the three-year cutting. Hence twelve years is far too long to wait both from the standpoint of cost of eradication of *Ribes* and from the standpoint of potential production of sporidia on the blister rust infected *Ribes* leaves.

#### Chemical Eradication.

In 1927 an area of approximately 20 acres where *R. inerme* existed in such profusion as to make hand pulling impractical was encountered. At that time it was found that eradication of those bushes would necessitate completely clearing the land so intertwined were the *R. inerme* roots with the roots of alders, willows and other species of the heavy brush cover. Hence it was decided to wait until a spray had been found or developed which would satisfactorily kill *R. inerme*.

Due to the extensive distribution of blister rust as found in the fall of 1928 it was decided to spray the *R. inerme* concentrations in 1929 with the sodium chlorate and "Atlacide" sprays chiefly to reduce the *R. inerme* live stem as much as possible and also as a further check upon the effectiveness of these sprays on the species in question. Table No. 4 shows the results of spraying:



Ecological investigations in the area from the expedition

as follows:

1. Although investigation of insect fauna in 1937 and 1938 was not as extensive as in 1936, it was still considerable. The results of the investigations in 1937 and 1938 are given in the tables. The results of the investigations in 1936 are given in the tables. The results of the investigations in 1936 are given in the tables.

2. Amount of insect fauna in the area is an important factor in the study of the fauna. The results of the investigations in 1937 and 1938 are given in the tables. The results of the investigations in 1936 are given in the tables.

3. Although there were fewer insects in 1937 and 1938 than in 1936, the results of the investigations in 1937 and 1938 are given in the tables. The results of the investigations in 1936 are given in the tables.

#### Ecological investigations

In 1937 an area of approximately 1000 m<sup>2</sup> was investigated. The results of the investigations in 1937 and 1938 are given in the tables. The results of the investigations in 1936 are given in the tables.

Not only the extent of the investigations in 1937 and 1938 was considerable, but the results of the investigations in 1937 and 1938 are given in the tables. The results of the investigations in 1936 are given in the tables.



TABLE NO. 4

RESULTS OF SPRAYING R. INERME CONCENTRATIONS  
IN JULY AND AUGUST, 1929

Eradication Type	Acres	Spray Used		Man-days	
		Number Gallons	Gallons Per Acre	Total	Per Acre
L	5.33	114	21	5.36	1.00
M	13.50	654	48	20.66	1.53
H	1.60	239	149	5.50	3.44
Combined	20.43	1,007	49	31.53	1.54

The effectiveness of the above spraying can not be determined, of course, until the 1930 field season.

A small patch of *R. viscosissimum* bushes on a logged over area was sprayed to determine the feasibility of spraying heavy concentrations of *R. viscosissimum* seedlings which frequently come in along chutes and skidways. The effectiveness of this method of eradication can also be determined in the 1930 field season.

COST OF OPERATION

The field cost of conducting studies and experiments done by the re-eradication project on the Coeur d'Alene National Forest are shown in Table No. 5.



# TABLE NO. 1

## RESULTS OF SPRAYING E. VISCOSISSIMA IN THE FIELD IN JULY AND AUGUST, 1933

Location	Area	Number of plants	Number of plants	Number of plants
1	6.83	114	114	114
2	13.50	84	84	84
3	1.82	140	140	140
Combined	22.15	338	338	338

The effectiveness of the above spraying was not determined of course, until the 1930 field season.

A small portion of E. viscossissima was on a field of corn. Areas were sprayed to determine the feasibility of spraying corn. Concentrations of E. viscossissima were found in the corn in some places. The effectiveness of this method of eradication can also be determined in the 1937 field season.

### FIELD OF CORN

The field was of corn. The field was sprayed on the 1930 field season. The results are shown in Table No. 2.



TABLE NO. 5

COST OF OPERATION

	Item	Cost
Salaries	Supervisors	\$1,116.66
	Temporary Employees	2,070.93
Subsistence	Salaries of Cooks	368.50
	Food Used	927.11
	Transportation of food	220.00
General	Depreciation	224.72
Equipment	Transportation	84.58
Spraying equipment	Depreciation	8.07
Miscellaneous	Supplies	39.12
	Expenses	33.91
	Repairs	19.92
	Twine	60.12
Chemical	Chemical Used	81.25
	Transportation	11.93
Transportation Men		158.91
Total		\$5,425.73

The supervisors' salaries item includes salary of the field supervisor for 6 months plus the salary of the general supervisor for a proportionate share of this period.

SUMMARY OF RE-ERADICATION BY HAND-PULLING METHODS  
1928 AND 1929

Due to the smallness of many of the seedlings pulled by re-eradication crews in 1928 and 1929 it seems definitely settled that re-eradication only two years following original eradication of Ribes by hand-pulling methods is too soon to conduct this type of work. It is therefore recommended that re-eradication be delayed to the third year or even the fourth year unless other factors of consideration make a four year delay inadvisable.

Data secured by the operation on the Kaniksu National Forest in 1928 and the one on the Coeur d'Alene National Forest in 1929 give a fair average basis for forecasting the cost of re-eradication in the future. Table No. 6 shows the averages for the two years work.



# TABLE 1

## Cost of Operation

Item	1938	1939
Salaries	10,000	10,000
Supplies	5,000	5,000
Transportation	2,000	2,000
General	1,000	1,000
Equipment	1,000	1,000
Operating	1,000	1,000
Miscellaneous	1,000	1,000
Chemical	1,000	1,000
Transportation	1,000	1,000
Total	33,000	33,000

The supervisor's salaries were increased by the field supervisor for a definite gain in the supervisor for a proportionate share of this work.

## COMPARISON OF RESEARCH COSTS

1938 and 1939

Due to the smallness of many of the samples of re-replication crews in 1938 and 1939 it was not possible to re-replication only two years following original completion of lines by hand-digging methods in the same area. It is therefore recommended that re-replication be made to the third year or even the fourth year. This factor of consideration makes a four year study imperative.

Data secured by the operation on the same area in 1938 and the one on the Lower Division Station Forest in 1939 is a fair average basis for projecting the cost of re-replication in the future. Table No. 2 shows the average for the two years.



TABLE NO. 6

## RESULTS RIBES RE-ERADICATION 1928 AND 1929

Eradication Type	Acres Worked		Ribes Per Acre Pulled		Man-days Per Acre		Cost Per Acre	
	1928	1929	Total	1928	1929	Average	1928	1929
Stream	92.0	193.7	285.7	187.4	67.3	106.0	\$5.49	\$2.71
D.M.	36.0	146.5	182.5	.1	.3	.2	.31	.26
O.M.	399.0	1,632.2	2,031.2	3.5	5.4	5.0	.47	.37
D.P.	339.9	445.5	785.4	2.1	3.9	3.1	.51	.45
O.P.	1,591.2	163.9	1,745.1	9.2	9.9	9.2	.93	.89
D.R.	180.1	494.0	674.1	4.3	.2	1.3	.83	.30
O.R.	186.0	80.0	266.0	4.2	21.9	9.5	.28	.66
C.O.		1,554.0	1,554.0			115.4	.10	.78
All	2,824.2	4,699.8	7,524.0	12.6	43.9	32.2	\$0.94	\$0.72



RESULTS FROM INVESTIGATION 1938 AND 1939

Year	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	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## EXPERIMENTAL APPLICATION OF RIBICIDES

By

C. C. Strong, Associate Forester

W. G. Guernsey, Junior Forester

H. R. Offord, Agent

### INTRODUCTION

For several years chemical investigations have been conducted by the Western Office of Blister Rust Control for the express purpose of determining which chemical mixture or solution gives the greatest promise of becoming an effective Ribicide. Ribicide is here and hereafter used to designate any chemical agent destructive to Ribes. During the progress of this investigative work in the past certain chemical sprays were developed but two factors limiting their use were encountered. These factors are (1) high cost of basic chemicals involved and (2) failure of the sprays developed to bring about a satisfactory killing action on currant and gooseberry species other than Ribes petiolare. With the first factor in mind the men engaged upon chemical investigations had investigated the mechanism of the toxic action of sodium chlorate and subsequently recommended using dilute chlorate sprays in slightly acid solution for the eradication of R. petiolare. Research work on the matter of a suitable Ribicide for R. lacustre and R. inerme, moreover, had resulted by the spring of 1929 in development of certain other sprays. The exigencies of stream type eradication called for a large scale field test of the new sprays.

Observations (many of them contradictory in nature) have been made by various investigators concerning the most favorable time of the year for applying chlorate sprays. In the course of experimental chemical eradication of Ribes it had been observed that early season application in the case of R. inerme and R. lacustre gave a higher percentage of kill than late season application of the same spray. R. petiolare seemed to be quite susceptible up to a certain time rather late in the growing season. The proposed reduction in concentration of field sprays necessitated more accurate information concerning the seasonal effect on the toxicity of field sprays to Ribes. Furthermore, the addition of the hygroscopic agent calcium chloride appeared to make the sodium chlorate somewhat less toxic and in view of the proposed reduction in concentration for general field work more complete data on this point was considered desirable.

In addition to the experiments with sodium chlorate, tests were to be made of a copper complex (copper cyanide tetrasodiumthiosulphate) which had been devised in the course of the investigative work at Berkeley. This compound showed such promising results on R. inerme and R. lacustre in the greenhouse tests that a large scale field test of the compound appeared to be necessary in order to determine its suitability for general field use.



EXPERIMENTAL AND FIELD TESTS

C. G. Strong, Associate Director  
F. G. Greenhouse, Junior, Director  
F. R. Olfert, Agent

INTRODUCTION

For several years chemical investigations have been conducted by the Eastern Office of Blister Rust Control for the purpose of determining which chemical mixture or solution gives the greatest promise of becoming an effective fungicide. It has been found that after used to designate any chemical agent destructive to blisters. During the progress of this investigation work in the past certain chemical sprays were developed but two factors limiting their use were encountered. These factors are (1) high cost of basic chemicals involved and (2) failure of the sprays developed to bring about satisfactory killing action on current and possibly on other than Ribes petiolare. With the first factor in mind the work upon chemical investigations has investigated the mechanism of the toxic action of sodium chlorate and has developed a recommended dilute chlorate spray in slightly acid solution for the application of R. petiolare. Research work on the matter of a suitable fungicide for R. petiolare and E. inaequalis, however, has been limited by the expense of development of certain other sprays. The expense of stream type eradication called for a large scale field test of the new sprays.

Observations (many of them contradictory) in various years have been made by various investigators concerning the most favorable time of year for applying chlorate sprays. In the course of experimental chemical eradication of blisters it had been observed that early application in the case of R. inaequalis and R. petiolare gave a higher percentage of kill than late season application of the same spray. R. petiolare seemed to be quite susceptible up to a certain time rather late in the growing season. The second eradication in comparison of field sprays necessitated more accurate information concerning the seasonal effect on the toxicity of blisters sprays to Ribes. Furthermore, the addition of the hygroscopic agent a little chlorate appeared to make the sodium chlorate somewhat less toxic in the field of the proposed eradication in concentration for general field work with complete data on this point was considered desirable.

In addition to the experiments with sodium chlorate, tests were made to be made of a copper complex (copper glycine butyrolactone complex) which had been devised in the course of the investigation work at Berkeley. This compound showed such promising results in the greenhouse tests that it was tested in the field in order to determine its value for general field use.



A suitable area for a large scale experiment was located at Clarkia, Idaho, where R. petiolare, R. lacustre and R. inerme occurred in such numbers and distributed in such a manner that it was possible to lay out half-acre plots containing all three. A series of chlorate and copper complex sprays were applied to consecutive half-acre plots on a 14-day rotation from June to September. Certain other investigations of minor importance were conducted. These will be noted under purposes and results.

It is proposed also to use the results of these large scale field experiments as a practical field basis for the correlation of laboratory research such as the analysis of *Ribes* stems, roots and leaves for starch which is being undertaken at the present time at the University of Idaho.

#### PURPOSES

1. To test the effectiveness, under actual field conditions, of any spray that had shown promise as a Ribicide in laboratory experiments.
2. To determine the relationship between time of application during the day and degree of effectiveness of any given spray.
3. To determine seasonal effect on the toxicity of chemical to *Ribes* and the modifications of that seasonal effect caused by:
  - a. Concentration of spray.
  - b. pH value of spray.
  - c. Presence of different hygroscopic agents.
4. To compare effectiveness of refuse molasses and glycerine as a sticker and binder of the new complex sprays.
5. To try out fireproofing materials for clothing used in chemical application.

#### LOCATION AND DESCRIPTION OF AREA

It was believed by those who selected the area for field tests of sprays that the most ideal area is one on which there is a goodly representation of R. petiolare, R. lacustre and R. inerme. The three species noted are the main stream type *Ribes* species occurring in the Inland Empire. The relative effectiveness of sprays on the *Ribes* species could be far more accurately obtained if each plot had each of the three species well represented.



A suitable area for a large scale experiment was located at Olmitz, Idaho, where H. petiolare, E. fasciatus and E. fasciatus in each number and distributed in such a manner that it was possible to lay out half-acre plots containing all three. A series of replicate and copper complex sprays were applied to consecutive half-acre plots on a 14-day rotation from June to September. Certain other investigations of minor importance were conducted. These will be noted under purposes and results.

It is proposed also to use the results of these large scale field experiments as a practical trial basis for the correlation of laboratory research such as the analysis of Ribes stems, root and leaves for starch which is being undertaken at the present time at the University of Idaho.

## PURPOSES

1. To test the effectiveness, under actual field conditions, of any spray that had shown promise as a Ribicide in laboratory experiments.

2. To determine the relationship between time of application and the day and degree of effectiveness of any given spray.

3. To determine seasonal effect on the toxicity of chemical to Ribes and the modifications of that seasonal effect caused by:

- a. Concentration of spray.
- b. pH value of spray.
- c. Presence of different hygroscopic agents.

4. To compare effectiveness of release-moisture and sticky sprays and hinder of the new complex sprays.

5. To try out fireproofing materials for clothing used in chemical application.

## LOCATION AND REPRESENTATION OF AREAS

It was believed by those who selected the area for Ribes tests of sprays that the most ideal area is one in which there is a goodly representation of E. petiolare, E. fasciatus and E. fasciatus. The three species noted are the main stem type Ribes species occurring in the inland Empire. The relative effectiveness of sprays on the Ribes species could be far more accurately obtained if each of the three species were well represented.





W. 732-Man engaged in spraying Ribes petiolaris on his respective strip.



W. 732-Man filling knapsack spray tank at mixing station preliminary to spraying.







After an exhaustive search an area was selected. This area constitutes a part of the Merry Creek drainage lying within townships 42 and 43 north, range 2 east, Boise Meridian. Merry Creek flows into the Middle Fork of the St. Maries River about one mile east of Clarkia, Idaho. Before the final selection of the area was made it was necessary to secure the permission of all owners whose property would be involved. No serious opposition was encountered in securing the necessary cooperation of owners and in the end full consent of all was obtained.

It is very doubtful if any area could have been found in North Idaho where conditions more nearly approached the ideal set up as a guide when the search for an area began. In fact, of the 141 plots sprayed 129 had all three species in large quantities. All plots had R. petiolare, only three plots did not have R. lacustre and only twelve did not have R. inerme bushes. Furthermore, there were probably more feet of Ribes live stem present on this area before spraying began than on any other equal area in North Idaho. The illustration on the preceding page gives some idea of the mass of brush and Ribes occurring on the Merry Creek area.

Merry Creek drains a rather extensive area which supports an excellent stand of white pine of all age classes. Near the plots, however, the stand is largely of about 40-year age class.

#### METHODS, EQUIPMENT AND MATERIALS

Plots. Each plot had an area of one-half acre and was rectangular in shape with sides laid out in cardinal directions. Plots were marked with a substantial cedar post at each corner and the necessary numbers and symbols indicated with durable paints. Plot locations are shown on the map at the end of this report.

1. Plot sections. Each plot was divided into three sections. The purpose of this was to facilitate having one section sprayed during the early part of the day, the second during the middle and the third during the latter part of the day. The purpose was to determine whether or not time of applying spray during the day had any influence on effectiveness.

2. Ribes occurrence. Under conditions as severe as those encountered on the Clarkia plots an accurate estimate of Ribes live stem was very difficult to make. However, great effort was expended to make this estimate as accurate as possible. Not only was live stem for each plot recorded by Ribes species but the same information was obtained for each section of each plot. The relative effectiveness of the various sprays used will largely be determined by the per cent of live stem killed on







each plot by species. No good purpose can be served by including in this report the live stem for each plot. However, a sample form on which plot data were recorded is shown at the end. The average feet of live stem per species for each plot was as follows:

- |                         |          |
|-------------------------|----------|
| (1) <u>R. petiolare</u> | = 24,562 |
| (2) <u>R. lacustre</u>  | = 6,351  |
| (3) <u>R. inerme</u>    | = 11,263 |

Methods of Spraying. All spraying was done with knapsack sprayers elsewhere described. Methods of spraying were quite similar to those already described differing only in that the one-half-acre plots were individual blocks on this operation.

Materials Used. In all, 41 different spray solutions were used. Some of these differed only in pH value. The formulae of the sprays used in experimental work are shown in Table No. 1 and include concentration of chemical, pH value of solution and spreader used. pH value may be defined as the log of the reciprocal of the hydrogen ion concentration of a solution. For pure water this value is 7. A solution having a pH value of 7 therefore is considered neutral. Scientific nomenclature has designated as alkaline a solution whose pH is numerically greater than 7 and an acid solution as one having a numerical value less than 7.

There are several factors which influence the pH value of a solution when a certain chemical is dissolved in water. Changes in the acidity of the water supply and a variation of acid or alkali-forming impurities in the chemicals are the most important factors encountered in field practice. If a certain pH value is required it is usually necessary to adjust the pH by means of suitable chemical reagents. This is done most readily under field conditions by adding a small amount of dilute acid (e.g. hydrochloric) or dilute alkali (e.g. sodium hydroxide) to the spray solution. The addition of acid decreases the pH value numerically while the addition of alkali increases it. Fine adjustment is obtained by adding a few drops of an indicator mixture (methyl red plus brom thymol blue) to a few cc's of the solution to be tested and comparing the color so obtained with a standard color chart. Identical spray formulae differing only in pH value of the spray were used in these experiments to determine to what extent the pH value of solution influences the effectiveness of the spray.



1. The first step in the process is to identify the problem. This involves gathering information about the situation and determining what needs to be done. Once the problem is identified, the next step is to develop a plan. This involves setting goals and determining the steps that need to be taken to achieve those goals. Once a plan is developed, the next step is to implement the plan. This involves putting the plan into action and monitoring progress. Finally, the last step is to evaluate the results. This involves assessing the effectiveness of the plan and making adjustments as needed.

300,000	=	$\frac{200,000}{200,000 + 200,000}$	0.50	(5)
100,000	=	$\frac{100,000}{200,000 + 200,000}$	0.25	(6)
50,000	=	$\frac{50,000}{200,000 + 200,000}$	0.125	(6)

[illegible][illegible]



# Results of Work in Field

Sprays Used. The Following table shows plots sprayed with each spray:

TABLE NO. 1

## SPRAYS USED AND PLOTS SPRAYED WITH EACH

Plot No.	Spray Solution Applied
1-23-43-62-77	NaClO <sub>3</sub> .89# per gal. pH 6.5 + Glue (2)
2-24	NaClO <sub>3</sub> 2.7# per gal. pH 6.5
3-25-45-64-79	NaClO <sub>3</sub> .89# per gal. + CaCl <sub>2</sub> .47# pH 6.5
4-26	NaClO <sub>3</sub> 2.7# per gal. + CaCl <sub>2</sub> 1.4# pH 6.5
5-27-47-66-81	NaClO <sub>3</sub> .89# per gal. + MgCl <sub>2</sub> .84# pH 6.5
6-28	NaClO <sub>3</sub> 2.7# per gal. + MgCl <sub>2</sub> 2.58# pH 6.5
7-29-48-82-91	Cu Complex 2.65# per gal. pH 6.5 + Molasses (3)
8-30-49-83	Cu Complex 3.13# per gal. pH 6.5 + Molasses
9-31-50-84	Cu Complex 1.03# per gal. pH 6.5 + Molasses
10-32-51-85	Cu Complex 2.06# per gal. pH 6.5 + Molasses
11(1)-33(1)-52(1)-67(1)-86(1)	NaClO <sub>3</sub> .45# per gal. pH 8
11-33-52-67-86	NaClO <sub>3</sub> .89# per gal. pH 8
12-34	NaClO <sub>3</sub> 2.7# per gal. pH 8
13-35-54-69-88	NaClO <sub>3</sub> .89# per gal. + CaCl <sub>2</sub> .47# per gal. pH 8
13(1)-35(1)-54(1)-69(1)-88(1)	NaClO <sub>3</sub> .45# per gal. + CaCl <sub>2</sub> .23# per gal. pH 8
14-36	NaClO <sub>3</sub> 2.7# per gal. + CaCl <sub>2</sub> 1.4# per gal. pH 8
15-37-56-71-90	NaClO <sub>3</sub> .89# per gal. + MgCl <sub>2</sub> .84# per gal. pH 8
15(1)-56(1)-71(1)-90(1)	NaClO <sub>3</sub> .45# per gal. + MgCl <sub>2</sub> .42# per gal. pH 8
16	NaClO <sub>3</sub> 2.7# per gal. + MgCl <sub>2</sub> 2.58# per gal. pH 8
17-38-57-72-95	NaClO <sub>3</sub> .89# per gal. pH 4
17(1)-38(1)-57(1)-72(1)-95(1)	NaClO <sub>3</sub> .45# per gal. pH 4
18	NaClO <sub>3</sub> 2.7# per gal. pH 4
19(1)-40(1)-59(1)-74(1)-97(1)	NaClO <sub>3</sub> .45# per gal. + CaCl <sub>2</sub> .23# per gal. pH 4
19-40-59-74-97	NaClO <sub>3</sub> .89# per gal. + CaCl <sub>2</sub> .47# per gal. pH 4
20	NaClO <sub>3</sub> 2.7# per gal. + CaCl <sub>2</sub> 1.4# per gal. pH 4
21(1)-42(1)-61(1)-76(1)-99(1)	NaClO <sub>3</sub> .45# per gal. + MgCl <sub>2</sub> .42# per gal. pH 4
21-42-61-76-99	NaClO <sub>3</sub> .89# per gal. + MgCl <sub>2</sub> .84# per gal. pH 4
22	NaClO <sub>3</sub> 2.7# per gal. + MgCl <sub>2</sub> 2.58# per gal. pH 4
23(1)-43(1)-62(1)-77(1)	NaClO <sub>3</sub> .45# per gal. pH 6.5
25(1)-45(1)-64(1)-79(1)	NaClO <sub>3</sub> .45# per gal. + CaCl <sub>2</sub> .23# per gal. pH 6.5
27(1)-47(1)-66(1)-81(1)	NaClO <sub>3</sub> .45# per gal. + MgCl <sub>2</sub> .42# per gal. pH 6.5
37(1)	NaClO <sub>3</sub> .45# per gal. + MgCl <sub>2</sub> .23# per gal. pH 8
39-58-76-96	Attlacide .58# per gal. pH 4
41-60-75-98	Attlacide 1.35# per gal. pH 4
44-63-78	Attlacide .58# per gal. pH 6.5
46-65-80	Attlacide 1.35# per gal. pH 6.5
53-63-87	Attlacide .68# per gal. pH 8
55-70-89	Attlacide 1.36# per gal. pH 8
93	Cu Complex 1.03# per gal. + Glycerine (4)
92	Cu Complex 3.13# per gal. + Glycerine
94	Cu Complex 2.06# per gal. + Glycerine

- (1) Plots sprayed with a series of solutions added after original schedule was made up.
- (2) Glue (.01% of the dry weight of chemical) was added to all chlorate sprays including Attlacide as a sticker and spreader.
- (3) Molasses 1% to 3% by volume was used as indicated with copper complex sprays as a binder. The low grade molasses did not prove satisfactory as a sticker and spreader because of the resultant excessive gumming and clogging of pumps and nozzles.
- (4) Glycerine 1% to 3% by volume was used as indicated with copper complex sprays as a binder.







Observations of Sprayed Plots. Late season observations of the toxic action of dilute solutions of sodium chlorate indicated that alkaline solutions of sodium chlorate were less effective than the acid solutions on R. petiolare. The strongest concentration of chlorate to which magnesium chloride had been added as a hygroscopic agent gave indications of being considerably more toxic to R. inerme and R. lacustre than sodium chlorate-calcium chloride mixtures. Unfortunately the magnesium chloride mixtures appeared to be rather dangerous fire hazards and application of the strong solution was discontinued about the middle of July.

Copper complex sprays, the new Ribicide, appeared to be relatively ineffective on R. petiolare as greenhouse tests had previously shown. R. inerme and R. lacustre were much more susceptible than R. petiolare to the action of the copper sprays but did not react as satisfactorily as greenhouse plants. Sun forms of both R. lacustre and R. inerme were much more susceptible than the shade forms. It was also observed that glycerine when used as a binder was much more effective than the refuse molasses and in the former case the killing action of the copper complex was much more characteristic of the type of action secured at Berkeley. However, it is feared that the lateness of the season will militate somewhat against the toxic action of the glycerine-copper complex sprays.

The entire season's work at Clarkia was free from accidents resulting from the combustion of chlorate-soaked clothing and can be attributed in part to a process of fireproofing pants worn by the crewmen and in part to the careful supervision and enforcement of camp rules about keeping clothes washed and somewhat damp while on the job.

The Cost of the Operation. The following table shows the cost of the operation in detail:







TABLE NO. 2.

I t e m		Cost
Salaries	Supervisors	\$ 483.33
	Temporary men	1,058.48
Subsistence		410.90
General equipment	Cost	114.61
	Transportation	43.81
Spraying	Equipment	50.59
	Supplies	39.59
Miscellaneous	Expenses	379.72
	Repairs	7.63
	Twine	32.80
Chemical	Cost	833.30
	Transportation	45.48
Transportation of men		170.53
Total		\$3,670.77

Precautions Taken to Insure Protection of Crewmen from Possible Chlorate Burns. The fireproofing method used has been previously reported by H. R. Offord. One great difficulty encountered in using the measure was excessive shrinking of materials treated, i.e. pants. Especially was this true of the large scale operations where the larger men were forced to hand their pants down to the small men and buy new ones. Approximately 50 per cent of the men employed on chemical application work in all camps did not have clothing fireproofed. However, all men who came in contact with the chemical used extreme precaution in the matter of washing clothes, etc. The result was that of the 150 men having to do with chemical eradication during the summer, none had any mishap from fire caused by friction against dry clothing which had been saturated with chemical.

#### FUTURE WORK

The checking of the plot sprayed in 1930 and probably 1931 (as a final verification) will determine the relative effectiveness of the various sprays used. Checking will be started as early in the summer of 1930 as the vitality of bushes can be determined.



# TABLE NO. 2.

I		1934
Salaries	Supervisors	48,534
	Temporary men	1,052.41
Expenses		41,000
General equipment	Cost	11,127
	Transportation	4,321
Spaving	Equipment	6,327
	Expenses	34,000
Miscellaneous	Expenses	87.72
	Repairs	7.65
	Twine	38.30
	Cost	1,000.00
Medical	Transportation	44.48
Transportation of men		14,000
Total		85,574.71

Precautions Taken to Insure Protection of Operator from possible Chlorate Burns. The fireproofing method used has been previously reported by J. M. O'Brien. One great difficulty encountered in setting the measure was excessive spilling of water in the large tanks. Especially was this true of the large scale operations where the larger men were forced to lean their backs down to the small men and buy new coats. Approximately 50 per cent of the men employed on chemical application wear in all cases that have clothing fireproofed. However, all men who come in contact with the chemical need strict fireproofing in the matter of wearing clothes, etc. The result was that of the 100 men given to it in 1934, etc. examination during the summer, none had any injury from this cause or friction against dry clothing which had been saturated with chemical.

## TABLE NO. 3.

The checking of the spot checks in 1934 and 1935 was as follows (as a final verification) will determine the relative effectiveness of the various safety methods. Records will be started on safety in the summer of 1936 as the ability of chance can be determined.



SAMPLE FORN - WT-BRC-#50-6/1/29

APPLICATION OF CHEMICALS - 1929

Area Merry Creek Report by F. A. Walters  
 Plot No. 3 Location Merry Creek, Clarkia, Idaho  
 Date Sprayed 12/6/29 Chemical Used NaClO<sub>2</sub> .89# + CaCl<sub>2</sub> .47# + 1 Gal. Water  
pH 6.5

Section	No. 1		No. 2		No. 3		Total	
Length	4 chains		4 chains		4 chains		4 chains	
Width	27.5 links		27.5 links		27.5 links		1½ chains	
Time	8:30 a.m.		10:30 a.m.		1:40 p.m.		7 hours	
	10:30 a.m.		1:40 p.m.		3:30 p.m.			
Gals. Chem.	8½		10		16		34½	
Ribes	Feet	Concen-	Feet	Concen-	Feet	Concen-	Feet	Concen-
Conditions	L. S.	trations	L. S.	trations	L. S.	trations	L. S.	trations
R. pet.	6,300	12%	800	2%	1,600	5%	8,700	7%
R. lac.	300	1%	200	1%	200	1%	700	1%
R. inerme	800	2%	1,200	4%	2,000	8%	4,000	5%



2501 - REACTION TO MILITARY

Date: 10/15/50  
 Location: New York  
 Report by: J. Edgar Hoover  
 Subject: [illegible]

[illegible]











PRE-ERADICATION SURVEY ON PRIVATE AND FEDERAL  
WHITE PINE LANDS

By  
W. C. Guernsey,  
Junior Forester.

INTRODUCTION

Pre-eradication has come to be a recognized step in the Ribes eradication program. Information secured on such work, since pre-eradication was inaugurated two years ago, has proven invaluable in planning local control of blister rust. Full benefit from pre-eradication was realized during the field season just closed wherever Ribes eradication was done on a pre-eradicated area. On the contrary certain rather serious handicaps developed where it was necessary to carry on Ribes eradication on areas not pre-eradicated. As a result of the 1929 experience regarding the benefits derived from pre-eradication a decision was made to conduct pre-eradication on all areas to be eradicated of Ribes in the near future, so far as this can be forecasted.

PURPOSE OF WORK

To obtain information on the area necessary for planning the field organization for Ribes eradication and methods of procedure, such as amount of equipment and chemicals, volume and type of work, and data for a base map.

LOCATION AND DESCRIPTION OF THE AREAS

Pre-eradication on areas selected by the Potlatch Timber Protective Association officials (in the Association) are located in townships 38, 39 and 40 north, ranges 1, 2 and 3 east, Boise Meridian.

The areas pre-eradicated on the Clearwater Timber Protective Association are in townships 38, 39 and 40 north, ranges 4, 5 and 6 east, Boise Meridian. More specifically this includes the portion of Reed's Creek drainage not eradicated of Ribes in 1929.

The Clearwater National Forest pre-eradicated area is in townships 37, 38 and 39 north, ranges 7 and 8 east, Boise Meridian.

These areas are all within the white pine type and are all in the same geographic region. This region, in the north central portion of Idaho is a rough, rugged area having large streams with numerous small tributaries. There is a variation in elevation of from three thousand to seven thousand feet. In general, it represents a part of the region of maximum R. petiolare abundance.







## PROCEDURE AND METHODS

Pre-eradication was carried on from September 15 to October 10, following the close of the eradication camps.

The procedure in securing data is explained in detail in the 1928 annual report "Pre-eradication on the Clearwater National Forest". Men experienced in Ribes eradication were used in carrying on the work of pre-eradication.

## RESULTS OF WORK

Since eradication of Ribes was limited to the stream type pre-eradication was thereby considerably simplified. Table No. 1 shows the results of pre-eradication on the three areas:

TABLE NO. 1.

### RESULTS OF PRE-ERADICATION 1929

Area	Stream Type Acreage to be Sprayed			Stream Type Acreage to be Hand-pulled			Actual Stream Type to be Worked	Area to be Protected by Stream Type Ribes Eradication
	Type L	Type M	Type H	Type B	Type C	Type D		
Clearwater N. F.	625	548	233	535	717	168	2,826	35,000
Clearwater T.P.A.	133	205	10	370	530	363	1,611	32,000
Potlatch T.P.A.	437	199	24	1,346	168	90	2,264	60,000
Total	1,295	952	267	2,251	1,415	621	6,701	127,000

In addition to the acreage listed in the table about 100,000 acres more were examined in an extensive manner on the Clearwater National Forest. The men who did the work felt that the tremendous cost necessary to eradicate Ribes from this particular area would not be justified due to the poor quality of white pine reproduction present.

It will be noted that the percentage of the total area pre-eradicated on the Clearwater and Potlatch Associations which is classed as stream type is less than was the case on areas eradicated in 1929. On pre-eradication only actual stream type area is shown. On eradication it is necessary to work a narrow strip bordering stream type in addition to actual stream type because this border always has numerous Ribes bushes diminishing in density as distance from stream type becomes



## 2004年12月10日 星期四

Following the close of the inspection period, the organization was carried on from

The procedure in securing data is explained in detail in the 1928 annual report "The investigation on the Character of the Men experienced in the investigation were held in connection with the pre-employment.

Since eradication of ribes was limited to the extent of the  
eradication was thereby severely limited. There was a strong  
tendency to re-eradication on the three areas:

• • • • •

REF ID: A66087

In addition to the honeybees listed in the table about 100,000  
acres more were examined in an exhaustive manner on the 1st of April.  
The work of the 1st of April was a tremendous task because  
the honeybees were not yet in the field and the weather was  
not favorable for the bees to fly.

[illegible]



greater. This extra acreage is included at the time of eradication but not at the time of pre-eradication because it is such an invariable that it can always be accurately allowed for in estimates.

Another reason for lower stream percentage on the Potlatch Association is the large acreage centering west of Big Island where stream type had no Ribes and was not included in the stream type acreage of Table No. 1.

#### CONCLUSION

The prospect of continued eradication on the Clearwater National Forest was the reason for pre-eradication in the Oxford and Bungalow ranger districts. This region, on the western boundary of the forest and due north of the Musselshell district, (partly eradicated in 1929) is in the timbered portion of the forest.

#### RECOMMENDATIONS

1. Continue employment of men trained in Ribes eradication for use on pre-eradication crews.
2. Start pre-eradication as early in fall as possible before hard rains come.
3. Discontinue pre-eradication in early spring due to snow and high water preventing satisfactory results.



greater. This extra storage is indicated at the time of investigation but not at the time of pre-eradication because it is such an investigation that it can usually be accounted for in advance.

Another reason for lower stream percentage on the 1929 Association is the large storage entering west of the Island where stream type had no effect and was not included in the stream type storage of Table No. 1.

### CONCLUSIONS

The prospect of continued eradication on the Island National Forest was the reason for pre-eradication in the 1929 and 1930 ranger districts. This region, on the western boundary of the forest and the north of the Marshall district, the 1929 and 1930 is in the timbered section of the forest.

### RECOMMENDATIONS

1. Continue employment of men trained in insect eradication for use on pre-eradication crews.
2. Start pre-eradication as early in fall as possible before fall rains come.
3. Discontinue pre-eradication in early spring and in early fall.



COOPERATIVE LOCAL CONTROL,  
CLEARWATER TIMBER PROTECTIVE ASSOCIATION

By

B. A. Anderson,  
Junior Forester.

INTRODUCTION

Late in the summer of 1928 white-pine blister rust was found on the north and south forks of Reed's Creek in the vicinity of Headquarters, Idaho, on the lands of the Clearwater Timber Protective Association. All infections found were on the leaves of Ribes petiolare (wild black currant). Although no infected pines were found indications were that the Ribes infection was of local origin. This belief was later verified by the finding of pine infection in this region during August 1929. The pine infection was on 1923 wood.

The finding of blister rust infection was partially responsible for the final selection of the Reed's Creek drainage by the Clearwater Timber Protective Association as the location for initial cooperative Ribes eradication. Since the final selection of the area was not made until late in the spring of 1929 it was not possible to make the usual pre-eradication survey. However, it was possible for two men to go over the area in an extensive manner and obtain some needed information. Furthermore, the area had been covered by reconnaissance crews in previous years. Hence, a great deal was known of the difficulties to be met by the time work was started.

LOCATION AND DESCRIPTION OF AREA

The Reed's Creek drainage lies within townships 37, 38 and 39 north and ranges 2, 4, 5 and 6 east, Boise Meridian. The general plan was to begin at the head of the drainage and proceed as far down toward the mouth as time and funds would permit. The map accompanying this report shows the bounds of the eradicated area. Headquarters, Idaho was the hub around which operations centered.

The entire area protected is heavily timbered largely with pure stands of white pine with nearly all age classes represented but most of which falls within the "mature" or "just coming mature" class. There are no recent large burns within the acreage protected although the "Scofield burn" dipped into the northeast corner of the area. Hence, from the standpoint of pine values protected it is doubtful if a wiser choice could have been made. The fact that the Clearwater Timber Company, the principal owner of white-pine land in the region, is definitely committed to a policy of sustained yield management of its timber lands further enhances the economic valuation of control work done.



FOREST SERVICE  
UNITED STATES DEPARTMENT OF AGRICULTURE

U. A. Anderson,  
Junior Forester.

INTRODUCTION

Late in the summer of 1928 white-pine blight was found on the north and south forks of Lead Creek in the vicinity of Lead, Idaho, on the lands of the Clearwater Timber Protective Association. All infection forms were on the leaves of white-pine (Pinus contorta). Although no infected pines were found in the vicinity of the river infection was of local origin. This point was later verified by finding of pine infection in the region during the fall of 1928. The first infection was on 1928 wood.

The finding of white-pine blight was entirely unexpected for the final selection of the Lead Creek drainage by the Clearwater Timber Protective Association as the location for final cooperative white-pine eradication. Since the final selection of the area was not made until late in the spring of 1928 it was not possible to make a survey pre-eradication survey. However, it was possible for two men to go over the area in an extensive manner and obtain some needed information. Further, more, the area had been covered by reconnaissance crews in previous years. Hence, a great deal was known of the difficulties to be met by the time work was started.

LOCATION AND DESCRIPTION OF AREA

The Lead Creek drainage lies within townships 37, 38 and 39 north and ranges 2, 3 and 4 east, Boise Meridian. The general area was to begin at the head of the drainage and proceed as far as possible to the mouth of the same. The map accompanying this report shows the bounds of the eradicated area. Reconnaissance, however, the map around which operations centered.

The entire area protected is heavily timbered with white-pine stands of white pine with nearly all age classes represented and most of which falls within the "matured" or "past coming matured" class. There are no recent large burns within the acreage protected although the "Scotfield burn" dipped into the northeast corner of the area. The standpoint of pine values protected it is doubtful if a stand could have been made. The fact that the Clearwater Timber Land Company, principal owner of white-pine land in the region, is definitely committed to a policy of sustained yield management of the timber lands further enhances the economic valuation of control work done.



The topography of the region may be classed as gentle. Excellent soil and abundant rainfall result in dense flora and heavy timber stands. Numerous side drainages have networks of tributaries which fan out into numerous smaller tributaries, seepages and flat swampy areas. The aggregate is an area having an unusually heavy percentage of the total acreage classed as stream type. On the main stream and main tributaries extensive beaver dam areas greatly magnify the "difficulty of working" factor.

R. petiolare occurred along practically every stream in concentrations varying from light to heavy with medium predominating. Patches of R. petiolare were almost invariably found at and near the sources of the tributaries. R. lacustre was found to be fairly uniformly distributed over the entire area but very little R. inerme was found.

A network of main trails, in addition to the one road made the area fairly accessible. However, it was necessary to build temporary contact trails over which it was possible to take pack stock loaded with chemical to the spots where needed. In addition to this the Clearwater Timber Company officials were very accommodating in the matter of hauling supplies and equipment to camps located along Alder Creek which territory is traversed by the logging railroad.

Very little logging has been done in the Reed's Creek drainage. Wherever cutting has been done the timber has largely been logged to a 14" (D.B.H.) diameter limit, the slash disposed of and the area in general left in excellent condition for a new crop of white pine.

#### PURPOSES OF WORK

1. To continue complete eradication of all Ribes in the stream type of white-pine areas.
2. To establish a control program on private and state lands to be carried on in the future, and to develop a personnel for future work.

#### METHODS AND EQUIPMENT

Two camps of approximately 23 men each were employed, one at the mouth of Deer Creek and the other on Loop Creek near its junction with Alder Creek. The original plan was to haul all equipment and all supplies by Government owned Ford truck but heavy rains in June rendered the roads impassable by motor vehicle until early in July. Hence it was necessary to



The topography of the region may be classed as hilly. Excellent soil and abundant rainfall result in dense forest and heavy timber stands. Numerous small creeks have numerous rapids and falls which run out into numerous smaller tributaries, especially in the swampy areas. The aggregate is an area having an unusually heavy percentage of the total acreage classed as forest type. On the main stream and main tributaries extensive better dam areas greatly modify the "difficulty of working" factor.

2. Petiole occurred along practically every stream in concentrations varying from light to heavy with medium productivity. Patches of P. petiole were almost invariably found at and near the sources of the tributaries. P. laetitia was found to be fairly uniformly distributed over the entire area but very little P. laetitia was found.

A network of main trails, in addition to the one mentioned, made the area fairly accessible. However, it was necessary to build temporary contact trails over which it was possible to transport loads of chemicals to the agents where needed. In addition to the the O'Leary-Timber Company officials were very recommended in the matter of handling supplies and equipment to be transported along these Greek which territory is traversed by the Indian trail.

Very little logging has been done in the Newell Creek drainage. However cutting has been done (the timber has largely been logged to a 14" (D.B.H.) diameter limit, the class beyond of no use in the general left in excellent condition for a new crop of white pine.

## CONCLUSIONS

1. To continue complete eradication of all fishes in the stream type of white-pine areas.

2. To establish a control program on private and state lands to be carried on in the future, and to develop a personnel for future work.

## APPENDIX

Two camps of approximately 25 men each were employed, one at the mouth of Deer Creek and the other on Moon Creek near its junction with Alder Creek. The original plan was to have all equipment and all supplies by Government owned Ford truck and heavy rain in June rendered the roads impassable by motor vehicle nearly early in July. Hence it was necessary to



rely upon a team and wagon for a part of the hauling while the balance, due to the cooperation of the Clearwater Timber Company officials, was hauled on the logging railroad.

Three buildings were rented from the Clearwater Timber Protective Association and used to house a part of the Deer Creek camp, the rental fee for all summer being less than would have been the cost of constructing other quarters.

Two pack horses were used to distribute chemical to crews. For this purpose it was necessary to build approximately fourteen miles of passable horse trails along the north and south forks of Reed's Creek where existing trails did not adequately meet the needs of eradication crews. These trails, while not graded, can be utilized in the future as emergency fire trails. A small amount of chemical was back-packed to remote patches of R. petiolare.

It became necessary to establish small auxiliary camps (fly camps) on upper Alder Creek, the north and south forks of Reed's Creek and on Deer Creek, to work areas which were too far from main camps to be worked conveniently from them as bases.

#### RESULTS OF WORK

The following tables show a summary of the work accomplished on the Clearwater Timber Protective Association in 1929:



rely upon a team and wagon for a part of the hauling while the horses, due to the cooperation of the Clearwater Timber Company's tractor, the hauling on the logging railroad.

Three buildings were rented from the Clearwater Timber Company Protective Association and used to house a part of the Deer Creek camp, the rental fee for all summer being less than would have been the cost of constructing other quarters.

Two pack horses were used to distribute chemical to crews. For this purpose it was necessary to build approximately fourteen miles of passive horse trails along the north and south forks of Deer Creek where existing trails did not adequately meet the needs of eradication crews. These trails, while not graded, can be utilized in the future as emergency fire trails. A small amount of chemical was procured to remote patches of H. patula.

It became necessary to establish small auxiliary camps (one on upper Deer Creek, the north and south forks of Deer Creek, and one on Deer Creek, to work areas which were too far from main camp to be worked conveniently from there as bases.

#### RESULTS OF WORK

The following tables show a summary of the work accomplished by the Clearwater Timber Protective Association in 1925:



TABLE NO. 1.

## RESULTS RIBES ERADICATION - CAMP 1.

	Man-Days		Ribes Eradicated			Acres	
	Crewman	Foreman	Total	R. lacustre	R. petiolare	Worked	Gallons Spray Used
Hand pulled	319	80 1/4	399 1/4	91,375	14,799	2,912	109,086
Sprayed	640	174 3/4	814 3/4				
Total	959	255	1,214	91,375	14,799	2,912	109,086
						805.8	17,384

TABLE NO. 2.

## RESULTS RIBES ERADICATION - CAMP 2.

	Man-Days		Ribes Eradicated			Acres	
	Crewman	Foreman	Total	R. lacustre	R. petiolare	Worked	Gallons Spray Used
Hand pulled	388 3/4	138	526 3/4	135,119	8,162	766	144,047
Sprayed	495	130 1/4	625 1/4				
Total	883 3/4	268 1/4	1,152	135,119	8,162	766	144,047
						548.9	7,845
						1,030.7	7,845

TABLE NO. 3.

## RESULTS RIBES ERADICATION BY BOTH CAMPS COMBINED

	Man-Days		Ribes Eradicated			Acres	
	Crewman	Foreman	Total	R. lacustre	R. petiolare	Worked	Gallons Spray Used
Hand pulled	1,707 3/4	218 1/4	926	226,494	22,961	3,678	253,133
Sprayed	1,135	305	1,440				
Total	1,842 3/4	523 1/4	2,366	226,494	22,961	3,678	253,133
						935.7	25,229
						836.5	25,229



[illegible]

DATE MO. S.

COPIABLES - 3

STATION	SECTION	INSTRUMENT	DATE	TIME	REMARKS
1000	1000	1000	1000	1000	1000
1001	1001	1001	1001	1001	1001
1002	1002	1002	1002	1002	1002
1003	1003	1003	1003	1003	1003
1004	1004	1004	1004	1004	1004
1005	1005	1005	1005	1005	1005
1006	1006	1006	1006	1006	1006
1007	1007	1007	1007	1007	1007
1008	1008	1008	1008	1008	1008
1009	1009	1009	1009	1009	1009
1010	1010	1010	1010	1010	1010
1011	1011	1011	1011	1011	1011
1012	1012	1012	1012	1012	1012
1013	1013	1013	1013	1013	1013
1014	1014	1014	1014	1014	1014
1015	1015	1015	1015	1015	1015
1016	1016	1016	1016	1016	1016
1017	1017	1017	1017	1017	1017
1018	1018	1018	1018	1018	1018
1019	1019	1019	1019	1019	1019
1020	1020	1020	1020	1020	1020
1021	1021	1021	1021	1021	1021
1022	1022	1022	1022	1022	1022
1023	1023	1023	1023	1023	1023
1024	1024	1024	1024	1024	1024
1025	1025	1025	1025	1025	1025
1026	1026	1026	1026	1026	1026
1027	1027	1027	1027	1027	1027
1028	1028	1028	1028	1028	1028
1029	1029	1029	1029	1029	1029
1030	1030	1030	1030	1030	1030
1031	1031	1031	1031	1031	1031
1032	1032	1032	1032	1032	1032
1033	1033	1033	1033	1033	1033
1034	1034	1034	1034	1034	1034
1035	1035	1035	1035	1035	1035
1036	1036	1036	1036	1036	1036
1037	1037	1037	1037	1037	1037
1038	1038	1038	1038	1038	1038
1039	1039	1039	1039	1039	1039
1040	1040	1040	1040	1040	1040
1041	1041	1041	1041	1041	1041
1042	1042	1042	1042	1042	1042
1043	1043	1043	1043	1043	1043
1044	1044	1044	1044	1044	1044
1045	1045	1045	1045	1045	1045
1046	1046	1046	1046	1046	1046
1047	1047	1047	1047	1047	1047
1048	1048	1048	1048	1048	1048
1049	1049	1049	1049	1049	1049
1050	1050	1050	1050	1050	1050
1051	1051	1051	1051	1051	1051
1052	1052	1052	1052	1052	1052
1053	1053	1053	1053	1053	1053
1054	1054	1054	1054	1054	1054
1055	1055	1055	1055	1055	1055
1056	1056	1056	1056	1056	1056
1057	1057	1057	1057	1057	1057
1058	1058	1058	1058	1058	1058
1059	1059	1059	1059	1059	1059
1060	1060	1060	1060	1060	1060
1061	1061	1061	1061	1061	1061
1062	1062	1062	1062	1062	1062
1063	1063	1063	1063	1063	1063
1064	1064	1064	1064	1064	1064
1065	1065	1065	1065	1065	1065
1066	1066	1066	1066	1066	1066
1067	1067	1067	1067	1067	1067

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STUDIES HAVE BEEN CONDUCTED IN BOTH CARS AND IN THE LABORATORY



Due to the manner in which R. petiolare grows in dense clumps and masses it is impossible to count bushes sprayed. For this reason the tables shown have no accurate measure of the amount of R. petiolare destroyed. This might be given in feet of live stem but even so, only a rough estimate could be made.

The only measure of R. petiolare concentrations so far deemed practicable to make in the field is to record areas sprayed under three possible classifications. These classes are: light, medium and heavy, usually referred to as L., M., and H. Light concentrations include areas on which roughly from one to three per cent of the ground is covered by R. petiolare. In the same manner the percentage limit for M. and H. are 4-24 per cent and 25 per cent and up, respectively. The following table of spraying results demonstrates this method of classifying:



Due to the manner in which R. petiolare grows in dense clumps and masses it is impossible to count branches sprayed. For this reason the tables shown have no actual measure of the amount of R. petiolare destroyed. This might be given in feet of live stem but even so, only a rough estimate could be made.

The only measure of R. petiolare concentrations as far as is practicable to make in the field is to record areas sprayed under three possible classifications. These classes are: light, medium and heavy, usually referred to as L., M., and H. Light concentrations include areas on which roughly from one to three per cent of the ground is covered by R. petiolare. In the same manner the percentage limit for M. and H. are 4-24 per cent and 25 per cent and up, respectively. The following table of spraying results demonstrates this method of classification:



TABLE NO. 4.

## RESULTS OF RIBES ERADICATION BY SPRAYING METHODS

	Eradication Class												Total					
	Light				Medium				Heavy									
	Man-Days	Acres	Gals. Spray	Per Man-Day	Acres	Man-Days	Acres	Gals. Spray	Per Man-Day	Acres	Man-Days	Acres	Gals. Spray	Per Man-Day	Acres	Man-Days	Acres	Gals. Spray
Camp 1	239	150.6	4,334	.63	348 1/2	161.7	7,063	.47	227 1/4	74.5	5,987	.33	814 3/4	386.8	17,384	.47		
Camp 2	164 1/8	194.0	1,482	1.18	326 1/2	262.7	4,301	.80	134 1/2	92.2	2,062	.69	625 1/4	548.9	7,845	.88		
Both	403 1/8	344.6	5,816	.85	675	424.4	11,364	.63	361 3/4	166.7	8,049	.46	1,440	935.7	25,229	.65		

The results by camp of hand pulling are shown in the following table:

TABLE NO. 5.

## RESULTS BY HAND-PULLING ERADICATION METHOD.

	Acres Worked	Ribes Eradicated				Total	
		R. petiolare	R. lacustre	R. inerme	Per Acre	Man-Days	Acres Per Man-day
Camp 1	419.0	14,799	91,375	2,912	109,086	260 399 1/4	1.05
Camp 2	481.8	8,162	135,119	766	144,047	299 526 3/4	0.91
Both	900.8	22,961	226,494	3,678	253,133	281 926	0.97



PRESENTS CLIFFS RADIATION BY SEAWATER METHOD

The least of us go through all the same things and are all the same people.

**FOR THE FIRST TIME IN HISTORY.**

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# STATEMENT AND ANALYSIS OF COSTS

TABLE NO. 6.

## DISTRIBUTION OF COSTS BY CAMPS.

I t e m		C o s t		
		Camp No.1	Camp No.2	Total
Salaries	Supervisors	\$ 1,300.00	\$ 700.00	\$ 2,000.00
	Temporary men	4,299.74	4,489.43	8,789.17
Subsistence	Salaries of cooks	437.67	475.72	913.39
	Cost of food	2,061.71	1,925.86	3,987.57
	Transp. of food	228.34	241.10	469.44
General equipment	Cost	353.44	353.43	706.87
	Transportation	74.01	74.01	148.02
Spraying equip.		141.27	141.27	282.54
Miscellaneous	Supplies	76.15	76.15	152.30
	Expenses	67.21	67.21	134.42
	Repairs	39.62	39.62	79.24
	Twine	35.00	35.00	70.00
Chemical	Cost	2,114.28	981.72	3,096.00
	Transportation	250.88	130.00	380.88
Transportation men		252.39	220.69	473.08
Checking		375.00	375.00	750.00
Total		\$12,106.71	\$10,326.21	\$22,432.92

The above table shows the actual expenditures against each camp unit and the total for the entire period May 1 to October 31, inclusive. While actual eradication was conducted from June 15 to September 15 only, the balance of the period should be charged against the job because of time required for preparation and for pre-eradication in the fall.



STATEMENT AND ANALYSIS OF COSTS

TABLE NO. 8.

DISTRIBUTION OF COSTS BY OBJECT

Object		Camp No. 1		Camp No. 2		Total	
Salaries	Supervisors	\$ 1,250.00	\$ 1,250.00	\$ 1,250.00	\$ 1,250.00	\$ 2,500.00	\$ 2,500.00
	Temporary men	4,282.74	4,282.74	4,282.74	4,282.74	8,565.48	8,565.48
	Salaries of cooks	437.67	437.67	437.67	437.67	875.34	875.34
Subsistence	Cost of food	2,081.71	2,081.71	2,081.71	2,081.71	4,163.42	4,163.42
	Transport. of food	258.54	258.54	258.54	258.54	517.08	517.08
General equipment	Cost	323.44	323.44	323.44	323.44	646.88	646.88
	Transportation	74.01	74.01	74.01	74.01	148.02	148.02
Spraying equip.		141.27	141.27	141.27	141.27	282.54	282.54
Miscellaneous	Supplies	76.15	76.15	76.15	76.15	152.30	152.30
	Incense	67.21	67.21	67.21	67.21	134.42	134.42
	Reagents	35.62	35.62	35.62	35.62	71.24	71.24
	Twine	35.00	35.00	35.00	35.00	70.00	70.00
Chemical	Cost	5,114.38	5,114.38	5,114.38	5,114.38	10,228.76	10,228.76
	Transportation	250.86	250.86	250.86	250.86	501.72	501.72
Transportation men		222.33	222.33	222.33	222.33	444.66	444.66
Checkings		242.00	242.00	242.00	242.00	484.00	484.00
Total		12,081.71	12,081.71	12,081.71	12,081.71	24,163.42	24,163.42

The above table shows the actual expenditures at each camp unit and the total for the entire period May 1 to October 31, 1914. While actual expenditure was conducted from June 15 to September 15 only, the balance of the period should be charged against the job because of time required for preparation and for pre-estimation in the fall.



TABLE NO. 7.

## COST OF ERADICATION BY CAMP UNITS.

Camp No.	Cost of Hand Eradication			Cost of Chemical Eradication			Cost of Both Combined		
	Acre- age	Cost	Cost Per Acre	Acre- age	Cost	Cost Per Acre	Acre- age	Cost	Cost Per Acre
1	419.0	\$3,169.08	\$7.56	386.8	\$8,937.63	\$23.11	805.8	\$12,106.71	\$15.02
2	481.8	4,146.36	8.61	548.9	6,179.85	11.26	1,030.7	10,326.21	10.02
Both	900.8	\$7,315.44	\$8.12	935.7	\$15,117.48	\$16.56	1,836.5	\$22,432.92	\$12.22

Total area protected from the rust (in so far as stream type eradication will protect) 21,500 acres. The 21,500 acres is the area from which Ribes were eradicated in the stream type.  
Average cost per acre protected is \$1.04.

On the report sent to the Clearwater Timber Protective Association at the end of the 1929 field season the total cost of the operation was given as \$30,000.00. This charge was justified by necessity of carrying a skeleton supervisory organization the full year. Furthermore, considerable expense is involved for miscellaneous supplies, warehousing, equipment, overhauling, etc. Considering \$30,000.00 as the total cost of Ribes eradication on the Clearwater Timber Protective Association for the year May 1, 1929 to April 30, 1930, the average cost for protecting each acre of white pine timber within the protection zone was \$1.40.

Cost of Subsistence

The following table shows the manner in which meal costs were computed, the relative cost for each item involved, the number of meals served and the average cost of each.



STATEMENT

STATEMENT OF EXPENDITURES

General		Special		Total		Total	
Account	Amount	Account	Amount	Account	Amount	Account	Amount
Salaries	100.00	Salaries	100.00	Salaries	100.00	Salaries	100.00
Travel	50.00	Travel	50.00	Travel	50.00	Travel	50.00
Postage	25.00	Postage	25.00	Postage	25.00	Postage	25.00
Telephone	15.00	Telephone	15.00	Telephone	15.00	Telephone	15.00
Printing	10.00	Printing	10.00	Printing	10.00	Printing	10.00
Repairs	5.00	Repairs	5.00	Repairs	5.00	Repairs	5.00
Supplies	5.00	Supplies	5.00	Supplies	5.00	Supplies	5.00
Interest	1.00	Interest	1.00	Interest	1.00	Interest	1.00
Other	1.00	Other	1.00	Other	1.00	Other	1.00
<b>Total</b>	<b>212.00</b>	<b>Total</b>	<b>212.00</b>	<b>Total</b>	<b>212.00</b>	<b>Total</b>	<b>212.00</b>

Approved: \_\_\_\_\_ Date: \_\_\_\_\_

This statement is prepared to show the expenditures of the State of New York for the year ending June 30, 1911. It is divided into two parts, one for the General Fund and one for the Special Funds. The General Fund is divided into five classes, namely, Salaries, Travel, Postage, Telephone, and Printing. The Special Funds are divided into three classes, namely, Repairs, Supplies, and Interest. The total expenditures for the year are \$212,000.00.



TABLE NO. 8.

COST OF MEALS

Camp No.	Cost of Items				Number Meals Served	Average Cost Per Meal
	Cooks' Salaries	Food Costs	Transport- ing Food	Total Cost		
1	\$437.67	\$2,061.71	\$ 228.34	\$2,727.72	5,880	\$0.4639
2	475.72	1,925.86	241.10	2,642.68	5,508	0.4798
Both	\$913.39	\$3,987.47	\$469.44	\$5,370.40	11,388	\$0.4717

CHECKING THE EFFICIENCY OF RIBES ERADICATION

It was arranged early in the spring of 1929 to turn over the checking or inspection of work to be done to the men who have been engaged upon studies under project 4. It was felt that these men would be better fitted, due to their wide experience with the rust under varying conditions, to place a better valuation upon the work done, especially in terms of rust control.

Since checking efficiency of work is a necessary part of the operation, it is a logical charge against protection and a nominal allowance for checking was made. It was found that checking could be done satisfactorily by having one man attached to each camp for that purpose.

A report on effectiveness of eradication work done on the Clearwater Timber Protective Association is included elsewhere in the 1929 Annual Report of the Western Office.

RECOMMENDATIONS FOR FUTURE WORK

1. The advent of stream type eradication brought up a problem which was only partially foreseen. It has been the custom in the past to employ about 25 to 28 men in each camp. This custom is the result of certain experiments designed to strike a proper balance between a small, very mobile unit with necessarily high overhead costs and a larger unit with proportionately less charge against overhead.

It was decided, previous to starting work in June, 1929, that the size of camp should be reduced somewhat due to plans to work only stream type. About 21 to 23 men were employed in each camp. Even this size camp proved too large due to the heavier equipment necessary and the resultant immobility. It is therefore recommended that a still smaller unit be employed in the future where only stream type eradication is to be done.



## COST OF MEALS

Camp No.	Cook's Salaries	Cost of Items			Number Meals Served	Average Cost
		Food	Transport	Total		
1	\$487.67	\$2,081.71	\$288.34	\$2,770.72	8,308	\$3.33
2	479.72	1,923.38	241.10	2,644.20	8,308	\$3.18
Both	\$967.39	\$3,985.09	\$529.44	\$5,443.92	16,616	\$3.28

## CHECKING THE EFFICIENCY OF MEAL PREPARATION

It was arranged early in the spring of 1929 to have the checking or inspection of work to be done to the men who have been engaged upon studies under project 4. It was felt that these men would be better fitted, due to their wide experience with the river under varying conditions, to place a better valuation upon the work done, especially in terms of cost control.

Since checking efficiency of work is a necessary part of the operation, it is logical to have a system of checking and a reward allowance for checking was made. It was found that checking could be done satisfactorily by having one man attached to each camp for that purpose.

A report on effectiveness of excitation work done on the Clearwater Timber Protective Association is included elsewhere in the 1929 Annual Report of the Western Office.

## RECOMMENDATIONS FOR FUTURE WORK

1. The advent of stream type excitation brought up a problem which was only partially foreseen. It has been the custom in the past to employ about 25 to 30 men in each camp. The custom is the result of certain experiments designed to strike a proper balance between a small, very mobile unit with necessarily high overhead costs and a larger unit with proportionately less charge against overhead.

It was decided, previous to starting work in June, 1929, that the size of camp should be reduced somewhat due to plans to work only stream type. About 21 to 23 men were employed in each camp. Even this size camp proved too large due to the heavier equipment necessary for the resistant immobility. It is therefore recommended that a still smaller unit be employed in the future where only stream type excitation is to be done.



The employment of smaller units will very likely do away with the necessity for fly camps, mentioned earlier in this report.

2. During the progress of the operation R. petiolare bushes which were partially submerged by the high water at the time of original spraying, early in the season, sent forth sprouts as soon as the water receded. The result was a line of sprouts along either bank of the streams which necessitated a respraying operation at a later date.

It is suggested for the future that, whenever feasible, men be employed on hand pulling on upland streams until the water recedes before starting spraying operations on areas where bushes of R. petiolare are partially submerged.

3. The special grade of two-ply sewing twine used to mark boundaries of eradicated areas proved too weak. Three-ply sewing twine (with the smallest diameter possible to obtain) proved most satisfactory.

4. The reinforced "Brown" double-action hand pump proved very durable and entirely satisfactory as a means of spraying chemical on bushes.

5. Every man preferred the oval tank which straps on the "Trapper Nelson Pack Board" over the special tank designed and patented by personnel of this office. It is therefore recommended that the oval tank be adopted for future work or until such time as a better tank is made.

6. It is sometimes necessary to pack drums of chemical over temporarily constructed trails very difficult for a horse or mule to traverse with a heavy load. It was found that two 100-pound drums (111 lbs. including the weight of the container) were too much for one animal under these conditions. It is therefore recommended that containers which will hold 50 pounds net be provided or that 20 or 25 per cent of the chemical to be used be purchased in containers of that size.



The employment of similar units will vary slightly in each  
with the necessity for the capacity mentioned earlier in this report.

2. During the progress of the operation of the chemical plants which  
were partially submerged by the high water in the spring of 1917  
spraying, early in the season, sent forth a spray as soon as the  
water receded. The result was a film of sprays along with the  
of the streams which necessitated a resuming operation at a later  
date.

It is suggested for the future that, whenever feasible, the  
employed on hand pulling on upland streams until the water recedes  
before starting spraying operations on areas where chances of the  
are partially submerged.

3. The special grade of two-ply sewing twine used to mark boundaries  
of excluded areas proved too weak. Three-ply sewing twine (with the  
earliest disaster possible to obtain) proved most satisfactory.

4. The reinforced "brown" double-action heavy gun, proved very  
durable and entirely satisfactory as a means of carrying chemical or  
brushes.

5. Very few men preferred the oval tank which proved on the whole  
better for work over the special tank designed and patented by  
personnel of this office. It is therefore recommended that the oval tank  
be adopted for future work on until such time as a better tank  
is developed.

6. It is sometimes necessary to pump liquids of chemical over terrain  
which is sometimes difficult for a horse or mule to traverse  
with a heavy load. It was found that two 100-pound drums (111 lbs.  
including the weight of the container) were too much for one animal  
under these conditions. It is therefore recommended that containers  
which will hold 50 pounds not be provided or that 50 or 60 lbs. be sent  
chemical to be used in purchased in containers of that size.





W.736-Typical scene in the white pine region of the Clearwater Timber Protective Association.



W.849-This area was closely grazed by sheep after the ~~blue~~ petiolare was thoroughly sprayed with sodium chlorate and no ill effects on the sheep.







RESULTS OF CHECKING ON THE AREAS ERADICATED OF RIBES  
IN THE CLEARWATER TIMBER PROTECTIVE ASSOCIATION,  
IDAHO, 1929

by  
H. N. Putnam  
Associate Pathologist

The streams eradicated in the Reed's Creek drainage in 1929 were quite effectually checked with the exception of a portion of the North Fork of Reed's Creek, which was not completely eradicated of Ribes in 1929.

Tables No. 1 and 2 show the results of the checking by means of permanent and temporary check plots.

Stream	Location	Date	Permanent Plots		Temporary Plots		Total
			Area	Area	Area	Area	
Reed's Creek	Upper	1929	10.00	1.00	1.00	1.00	12.00
	Lower	1929	10.00	1.00	1.00	1.00	12.00
	North Fork	1929	10.00	1.00	1.00	1.00	12.00
	South Fork	1929	10.00	1.00	1.00	1.00	12.00
Clearwater Creek	Upper	1929	10.00	1.00	1.00	1.00	12.00
	Lower	1929	10.00	1.00	1.00	1.00	12.00
	North Fork	1929	10.00	1.00	1.00	1.00	12.00
	South Fork	1929	10.00	1.00	1.00	1.00	12.00



REPORT ON THE RESULTS OF THE EXAMINATION OF THE  
IN THE DISTRICT OF RIBES

1934

by

H. A. PRINCE

Associate Pathologist

The streamer eradicated in the year 1934 in  
 1933 were wise effectively checked with the exception of a certain  
 of the North Fork of the River, which was not completely  
 located of Ribes in 1933.

Tables No. 1 and 2 show the results of the examination of means  
 of permanent and temporary check lists.



TABLE NO. 1

## RESULTS OF CHECKING ERADICATED AREAS OF CLEARWATER TIMBER PROTECTIVE ASSOCIATION, IDAHO, BY PERMANENT PLOTS, 1929

Streams	Eradication Status	Plots	Number	% Concentration		Ribes Feet Live Stem Per Acre			Per Cent of Efficiency by Live Stem
				Area containing Ribes	Area of Ribes	R. petiolare	R. inerme	R. lacustre	
South Fork Reed's Creek, Deer Creek	Before	70	2,080	13.4	8.8	32,868	0	1,581	34,449
	After	40	1,214	-	-	409	0	0	409
Alder Creek, Loop Creek, North Fork Reed's Creek	Before	59	1,904	8.2	5.9	17,309	118	2,422	19,849
	After	40	1,418	-	-	154	0	358	512
									97.4
									98.8



CHAI



TABLE NO. 2

RESULTS OF CHECKING ERADICATED AREAS OF CLEARWATER TIMBER PROTECTIVE ASSOCIATION,  
IDAHO BY TEMPORARY PLOTS, 1929

	Number		Ribes Per Acre Left After Eradication								Total Ribes	
	Plots	Milacres	R. petiolare Bushes F.L.S.	R. inerme Bushes F.L.S.	R. viscosissimum Bushes F.L.S.	R. lacustre Bushes F.L.S.	R. viscosissimum Bushes F.L.S.	R. lacustre Bushes F.L.S.				
S. Fork Reed's Creek	649	11,420	5	101	0	0	Trace	1	6	211	11	313
Deer Creek	382	7,754	2	28	0	0	Trace	Trace	3	74	5	102
Alder Creek	723	12,738	4	69	Trace	18	0	0	14	364	18	451
N. Fork Reed's Creek	55	816	6	1,109	0	0	0	0	18	141	24	1,250



NOTED FOR THE PURPOSE OF THE FOLLOWING

TRIPLO GI LITHO DUBA STOLA, 1958



A study of Tables 1 and 2 will show that with the exception of the North Fork of Reed's Creek, a larger volume of Ribes per acre was left on the main streams, as represented by the permanent check plots, than on the tributaries as represented by the temporary check plots. This is probably due to the fact that Ribes occurred in their greatest abundance on the larger streams.

Again, it may be noted that, with the exception of the North Fork of Reed's Creek, R. petiolare constituted the bulk of Ribes left on areas checked by permanent plots, and R. lacustre on areas checked by temporary plots.

The North Fork of Reed's Creek showed the largest amounts of Ribes left per acre. This fact may be explained partly because the check of the area was not sufficient to give a true picture, and partly because eradication work was done at the end of the season when efficiency is apt to be low. Men are getting tired at the end of the season and their minds are occupied with thoughts of the coming school year. This condition results in poorer work being done.

Certain permanent plots were inspected after the application of one spray to the area and again examined after the second spray. Table No. 3 shows the results of this checking reduced to a per-acre basis. This information is shown also in the accompanying graphs which are based on figures in Table No. 3.



A study of Tables 1 and 2 will show that with the exception of the North Fork of Head's Creek, a large number of plots were left on the main stream, as represented by the permanent plots. This is probably due to the fact that these streams are the largest and have the greatest abundance on the larger streams.

Again, it may be noted that, with the exception of the North Fork of Head's Creek, the permanent plots, and the temporary plots, were checked by permanent plots, and the temporary plots.

The North Fork of Head's Creek shows the largest number of plots left over. This fact may be explained easily because the check of the area was not sufficient to give a true picture, and because eradication work was done at the end of the season and efficiency is left to be low. The two existing trees at the end of the season and their shade are compared with those of the coming season. This condition results in poorer work being done.

Certain permanent plots were inspected after the completion of one year to the area and again compared after one second year. Table No. 3 shows the results of this checking process to a certain extent. This information is shown in the second column of the table. The results are based on figures in Table No. 3.



EFFECT OF ONE AND TWO SPRAY APPLICATIONS ON ERADICATION AREAS OF CLEARWATER  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25  
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45  
46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65  
66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85  
86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105  
106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125  
126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145  
146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165  
166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185  
186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205  
206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225  
226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245  
246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265  
266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285  
286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305  
306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325  
326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345  
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366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385  
386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405  
406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425  
426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445  
446 447 448 449 450 451 452 453 454 455 456 457 458 459 460

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# BUSHES PER ACRE

## R. PETIOLARE



Before Eradication  
After first    ,,  
After second   ,,

## R. LACUSTRE



Before Eradication  
After first    ,,  
After second   ,,

Bushes

# FEET OF LIVE STEM PER ACRE

## R. PETIOLARE



Before Eradication  
After first    ,,  
After second   ,,

Ft. Live Stem

## R. LACUSTRE



Before Eradication  
After first    ,,  
After second   ,,

Ft. Live Stem

# AVERAGE FEET OF LIVE STEM PER BUSH

## R. PETIOLARE



Before Eradication  
After first    ,,  
After second   ,,

## R. LACUSTRE



Before Eradication  
After first    ,,  
After second   ,,

Ft Live Stem







An examination of Table No. 3 shows that on the plots checked R. petiolare constituted nearly 99% of the Ribes before eradication and that eradication reduced the feet of live stem of R. petiolare to approximately that of R. lacustre before eradication.

It is apparent that while the per cent of efficiency of R. petiolare eradication by bushes, or locations, is relatively low, by feet of live stem it is high. This relationship is also shown in the reduction in feet of live stem per location following the first and second eradication.

Much of the R. petiolare live stem surviving one eradication consisted of stems of bushes under water at the time of first spraying. The second eradication killed a considerable number of these. The bushes surviving the second eradication were largely missed bushes.

It may be observed that the second eradication showed no effect upon R. lacustre. This was because very little attempt was made to hand pull Ribes at the time of the second eradication.

From the standpoint of Ribes eradication a good job was done on the Clearwater Timber Protective Association. It remains to be seen whether or not sufficient protection was afforded the pines. Since blister rust is already established on or near the areas worked we should be able to obtain valuable data on this point in the future.

A plot of 2.1 acres on Deer Creek was laid off in 1929 on which only one spray was applied, and this early in the season. Data were taken relative to location of bushes, feet of live stem missed and stems under water when sprayed. This plot will be examined next year. The object of this study is to ascertain the effect of one spray early in the season upon the Ribes present.

4. To establish a control program to eradicate the disease and to carry on in the future, and to develop a general plan for future work.

#### LOCATION AND DESCRIPTION OF THE PLOTS

Two areas operated on by the Clearwater Timber Protective Association, which is located in the north western part of Idaho.

The personnel of the Clearwater Timber Protective Association, 1000 West of Pollock Creek, Coeur d'Alene, Idaho, 1929, 1930 and 1931.



An examination of Table 1 shows that the first checked E. petiolare constituted nearly 50% of the first radiation and that radiation reduced the first to live stem of E. petiolare to approximately 10% of the first radiation.

It is apparent that while the first radiation of E. petiolare radiation by bushes, or locations, is relatively low, by first of live stem it is high. This relationship is also shown in the reduction in first of live stem for location following the first and second radiation.

Much of the E. petiolare live stem surviving one radiation consisted of stems of bushes under water at the time of first radiation. The second radiation killed a considerable number of stems. The bushes surviving the second radiation were largely missed bushes.

It may be observed that the second radiation showed no effect upon E. laevis. This was because very little attempt was made to hand pull bushes at the time of the second radiation.

From the standpoint of river radiation a good job was done on the Greenwater Timber Protective Association. It remains to be seen whether or not sufficient protection was afforded the river. Since blister rust is already established on or near the river, we should be able to obtain valuable data on this point in the future.

A plot of 51 acres on Deer Creek was laid out in 1915 on which only one spray was applied, and this early in the season. We were taken relative to location of bushes, first of live stem and stems under water when sprayed. This plot will be examined next year. The object of this study is to ascertain the effect of one spray early in the season upon the river present.



COOPERATIVE LOCAL CONTROL  
POTLATCH TIMBER PROTECTIVE ASSOCIATION

By

W. G. Guernsey  
Junior Forester

INTRODUCTION.

Practical Ribes eradication was carried on in the stream type of the timber areas on the Potlatch Timber Protective Association during the past summer. Stream type is the mixture of trees and herbaceous growth bordering streams with numerous concentrations of wild Ribes generally present.

The eradication operations on this association were the result of an agreement between the Timber Protective Association and the Office of Blister-Rust Control. The agreement was made with the stipulation that for every dollar of association money expended the Office of Blister-Rust Control should spend two dollars with the actual field supervision in the hands of the Office of Blister-Rust Control. The total amount to be expended in the fiscal year 1930 was to be \$30,000.00.

A report was made to the Potlatch Timber Protective Association before the field work started stating the basis and nature of expenditures and work to be carried on during the field season, thus assisting the officials of the association in keeping track of the operations.

PURPOSES OF WORK

The purposes of the 1929 work in practical eradication of the hosts of white-pine blister rust on the Potlatch Timber Protective Association were:

1. To continue complete eradication of all Ribes in the stream type of white-pine areas.
2. To establish a control program on private and state lands to be carried on in the future, and to develop a personnel for future work.

LOCATION AND DESCRIPTION OF THE AREA.

Two camps operated on the Potlatch Timber Protective Association which is located in the north central part of Idaho.

The personnel of Camp 1 operated on the headwaters of the East Fork of Potlatch Creek, township 41 north, ranges 1, 2 and 3 east, Boise



COOPERATIVE LOCAL CONTROL  
POTATON TIMBER PROTECTIVE ASSOCIATION

W. A. Gurnsey  
Junior Forester

INTRODUCTION

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supervision in the hands of the Office of Blister-Rust Control. The  
total amount to be expended in the fiscal year 1930 was to be \$50,000.

A report was made to the Potatton Timber Protective Association  
before the field work started stating the basis and nature of expenditure  
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LOCATION AND DESCRIPTION OF THE AREA

Two camps operated on the Potatton Timber Protective Association  
which is located in the north central part of Idaho.

The personnel of Camp 1 operated on the headwaters of the West  
fork of Potatton Creek, township 31 north, ranges 1, 2 and 3 east, 31 west



Meridian and was later moved to Round Meadow Creek, township 39 north, range 1 east, Boise Meridian.

Camp 2 operated in the Gold Creek drainage, township 40 north, ranges 3 and 4 east; Deep Creek, township 39 north, range 2 east; and on lower Long Meadow Creek, township 39 north, range 1 east, Boise Meridian.

Mature white pine predominated on the upper East Fork of Potlatch Creek, Gold Creek and Deep Creek drainages. The areas surrounding Round Meadow and Long Meadow Creeks were mainly white-pine type with about twenty per cent pole class and the rest mature white pine.

#### METHODS, EQUIPMENT AND MATERIALS

The general methods, equipment and chemicals used are explained in detail in the introductory notes of the eradication report. These eradication methods were used on all the projects and are incorporated early in the report to prevent repetition by each eradication project leader.

A G.M.C. truck, one and one-half-ton capacity, purchased in 1927, was used to handle the transportation of supplies, equipment and men.

A one-half-ton Ford truck was used by the project leader to haul general supplies back and forth between camps and in moving small details of men to fairly distant parts of the eradication blocks.

A pack string consisting of six mules and a saddle horse was hired to transport supplies and equipment to camps off the roads. It was also necessary to move chemicals to points along streams where it was available for the chemical spraying crews.

The main warehouse was in Elk River and the packer and pack string were headquartered there to facilitate trips to the camps.

For short periods the camps were situated on passable roads and during that time it was very convenient to use the G.M.C. truck in moving supplies direct to camp. It was so arranged, however, that the pack string was kept busy during the entire season.

#### WORK PERFORMED AND RESULTS



Meridian and was later moved to Long Meadow Creek, Township 33 north, range 1 east, Boise Meridian.

Camp 2 operated in the Gold Creek drainage, Township 33 north, range 3 and 4 east; Deep Creek, Township 33 north, range 2 east; and on lower Long Meadow Creek, Township 33 north, range 1 east, Boise Meridian.

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The main warehouse was in Elk River and the packer and pack string were headquartered there to facilitate trips to the camps.

For short periods the camps were situated on accessible roads and during that time it was very convenient to use the G.M.C. truck in moving supplies direct to camp. It was so arranged, however, that the pack string was kept busy during the entire season.

#### WORK PERFORMED AND RESULTS



TABLE NO. 1

SUMMARY OF RESULTS OF RIBES ERADICATION BY HAND PULLING METHODS ON THE  
POTLATCH TIMBER PROTECTIVE ASSOCIATION

1929

Type	Camp No.	Ribes Pulled					R. inermis	Total	Man-Days		Acres	Ribes Per Acre
		R. lacustre	R. visco.	R. petiolare	R. irriguum	R.			Crewman	Foreman		
Stream	1	405,827	3,521	9,928		1,427		420,703	887.5	305.5	1,041.7	403
Dense pole	1	12,335	6,425					18,760	69.0	32.0	300.0	62
Stream	2	319,557	368	17,000	4,996			341,921	651.0	270.0	1,576.3	216
Total	1-2	737,719	10,314	26,928	4,996	1,427		781,384	1,606.5	607.5	2,918.0	267

The dense pole type worked by Camp 1 was made necessary by the finding of a concentration of blister-rust infection near the junction of Three Bear and Long Meadow Creeks.







TABLE NO. 2

SUMMARY OF THE RESULTS OF SPRAYING RIBES PETIOLARE ON  
THE POTLATCH TIMBER PROTECTIVE ASSOCIATION.

Eradication Class	Camp No.	Time		Acres	Gallons Spray
		Crewmen	Foreman		
M	1	146	29	76.1	5,883
M	2	178	47	105.3	3,976
M	Total	324	76	181.4	9,859

The concentration of Ribes varied considerably over the areas sprayed but it was found that the average was a medium class and was recorded as such in this report.

A. General Statement and Analysis of Costs of Ribes Eradication on the  
Potlatch Timber Protective Association

TABLE NO. 3

COST OF OPERATION.

Item		Cost		
		Camp No. 1	Camp No. 2	Total
Salaries	Supervisors	\$ 791.66	\$ 791.66	\$ 1,583.32
	Temporary men	5,048.70	4,432.24	9,480.94
Subsistence	Salaries of cooks	549.68	528.88	1,078.56
	Cost of food	1,951.19	1,687.58	3,638.77
	Trans. of food	471.36	478.66	950.02
	Cost	353.43	353.43	706.86
General equipment	Transportation	212.85	212.85	425.70
		141.27	141.27	282.54
Spraying equipment	Supplies	95.27	95.27	190.54
	Expenses	82.75	82.75	165.50
	Repairs	39.62	39.63	79.25
	Twine	40.00	40.00	80.00
Chemical	Cost	352.85	296.12	648.97
	Transportation	127.39	127.39	254.78
Transportation of men		156.02	156.01	312.03
Checking cost		375.00	375.00	750.00
Total		\$10,789.04	\$9,838.74	\$20,627.78



[illegible]

the concentration of Richard varied considerably over the years, and he was found that the average was a million miles and a half from the center of the galaxy.

8. 1951

DATE OF ORDER 1970

1940		1941		1942		1943		1944		1945		1946		1947		1948		1949		1950		1951		1952		1953		1954		1955		1956		1957		1958		1959		1960		1961		1962		1963		1964		1965		1966		1967		1968		1969		1970		1971		1972		1973		1974		1975		1976		1977		1978		1979		1980		1981		1982		1983		1984		1985		1986		1987		1988		1989		1990		1991		1992		1993		1994		1995		1996		1997		1998		1999		2000		2001		2002		2003		2004		2005		2006		2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023		2024		2025		2026		2027		2028		2029		2030	
1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030																																																																																											
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It will be noted that cost of operation was greater for Camp 1 than for Camp 2. This is accounted for largely by the fact that temporary men in Camp 2 were loaned to the Potlatch Timber Protective Association for two weeks to assist in fire suppression during an emergency and were paid salary and subsisted by the Association for that period. More chemical was used in Camp 1 than was used in Camp 2.

B. Cost of Eradicating Ribes from Stream Type by Each Camp Unit.

Camp	Cost of Eradication		Cost of Eradication		Cost of Eradication		Total
	Chemical	Manpower	Chemical	Manpower	Chemical	Manpower	
1	100.00	100.00	100.00	100.00	100.00	100.00	200.00
2	50.00	50.00	50.00	50.00	50.00	50.00	100.00
3	75.00	75.00	75.00	75.00	75.00	75.00	150.00
4	125.00	125.00	125.00	125.00	125.00	125.00	250.00
5	150.00	150.00	150.00	150.00	150.00	150.00	300.00
6	175.00	175.00	175.00	175.00	175.00	175.00	350.00
7	200.00	200.00	200.00	200.00	200.00	200.00	400.00
8	225.00	225.00	225.00	225.00	225.00	225.00	450.00
9	250.00	250.00	250.00	250.00	250.00	250.00	500.00
10	275.00	275.00	275.00	275.00	275.00	275.00	550.00
11	300.00	300.00	300.00	300.00	300.00	300.00	600.00
12	325.00	325.00	325.00	325.00	325.00	325.00	650.00
13	350.00	350.00	350.00	350.00	350.00	350.00	700.00
14	375.00	375.00	375.00	375.00	375.00	375.00	750.00
15	400.00	400.00	400.00	400.00	400.00	400.00	800.00
16	425.00	425.00	425.00	425.00	425.00	425.00	850.00
17	450.00	450.00	450.00	450.00	450.00	450.00	900.00
18	475.00	475.00	475.00	475.00	475.00	475.00	950.00
19	500.00	500.00	500.00	500.00	500.00	500.00	1000.00
20	525.00	525.00	525.00	525.00	525.00	525.00	1050.00
21	550.00	550.00	550.00	550.00	550.00	550.00	1100.00
22	575.00	575.00	575.00	575.00	575.00	575.00	1150.00
23	600.00	600.00	600.00	600.00	600.00	600.00	1200.00
24	625.00	625.00	625.00	625.00	625.00	625.00	1250.00
25	650.00	650.00	650.00	650.00	650.00	650.00	1300.00
26	675.00	675.00	675.00	675.00	675.00	675.00	1350.00
27	700.00	700.00	700.00	700.00	700.00	700.00	1400.00
28	725.00	725.00	725.00	725.00	725.00	725.00	1450.00
29	750.00	750.00	750.00	750.00	750.00	750.00	1500.00
30	775.00	775.00	775.00	775.00	775.00	775.00	1550.00
31	800.00	800.00	800.00	800.00	800.00	800.00	1600.00
32	825.00	825.00	825.00	825.00	825.00	825.00	1650.00
33	850.00	850.00	850.00	850.00	850.00	850.00	1700.00
34	875.00	875.00	875.00	875.00	875.00	875.00	1750.00
35	900.00	900.00	900.00	900.00	900.00	900.00	1800.00
36	925.00	925.00	925.00	925.00	925.00	925.00	1850.00
37	950.00	950.00	950.00	950.00	950.00	950.00	1900.00
38	975.00	975.00	975.00	975.00	975.00	975.00	1950.00
39	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	2000.00
40	1025.00	1025.00	1025.00	1025.00	1025.00	1025.00	2050.00
41	1050.00	1050.00	1050.00	1050.00	1050.00	1050.00	2100.00
42	1075.00	1075.00	1075.00	1075.00	1075.00	1075.00	2150.00
43	1100.00	1100.00	1100.00	1100.00	1100.00	1100.00	2200.00
44	1125.00	1125.00	1125.00	1125.00	1125.00	1125.00	2250.00
45	1150.00	1150.00	1150.00	1150.00	1150.00	1150.00	2300.00
46	1175.00	1175.00	1175.00	1175.00	1175.00	1175.00	2350.00
47	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	2400.00
48	1225.00	1225.00	1225.00	1225.00	1225.00	1225.00	2450.00
49	1250.00	1250.00	1250.00	1250.00	1250.00	1250.00	2500.00
50	1275.00	1275.00	1275.00	1275.00	1275.00	1275.00	2550.00
51	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	2600.00
52	1325.00	1325.00	1325.00	1325.00	1325.00	1325.00	2650.00
53	1350.00	1350.00	1350.00	1350.00	1350.00	1350.00	2700.00
54	1375.00	1375.00	1375.00	1375.00	1375.00	1375.00	2750.00
55	1400.00	1400.00	1400.00	1400.00	1400.00	1400.00	2800.00
56	1425.00	1425.00	1425.00	1425.00	1425.00	1425.00	2850.00
57	1450.00	1450.00	1450.00	1450.00	1450.00	1450.00	2900.00
58	1475.00	1475.00	1475.00	1475.00	1475.00	1475.00	2950.00
59	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	3000.00
60	1525.00	1525.00	1525.00	1525.00	1525.00	1525.00	3050.00
61	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	3100.00
62	1575.00	1575.00	1575.00	1575.00	1575.00	1575.00	3150.00
63	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	3200.00
64	1625.00	1625.00	1625.00	1625.00	1625.00	1625.00	3250.00
65	1650.00	1650.00	1650.00	1650.00	1650.00	1650.00	3300.00
66	1675.00	1675.00	1675.00	1675.00	1675.00	1675.00	3350.00
67	1700.00	1700.00	1700.00	1700.00	1700.00	1700.00	3400.00
68	1725.00	1725.00	1725.00	1725.00	1725.00	1725.00	3450.00
69	1750.00	1750.00	1750.00	1750.00	1750.00	1750.00	3500.00
70	1775.00	1775.00	1775.00	1775.00	1775.00	1775.00	3550.00
71	1800.00	1800.00	1800.00	1800.00	1800.00	1800.00	3600.00
72	1825.00	1825.00	1825.00	1825.00	1825.00	1825.00	3650.00
73	1850.00	1850.00	1850.00	1850.00	1850.00	1850.00	3700.00
74	1875.00	1875.00	1875.00	1875.00	1875.00	1875.00	3750.00
75	1900.00	1900.00	1900.00	1900.00	1900.00	1900.00	3800.00
76	1925.00	1925.00	1925.00	1925.00	1925.00	1925.00	3850.00
77	1950.00	1950.00	1950.00	1950.00	1950.00	1950.00	3900.00
78	1975.00	1975.00	1975.00	1975.00	1975.00	1975.00	3950.00
79	2000.00	2000.00	2000.00	2000.00	2000.00	2000.00	4000.00
80	2025.00	2025.00	2025.00	2025.00	2025.00	2025.00	4050.00
81	2050.00	2050.00	2050.00	2050.00	2050.00	2050.00	4100.00
82	2075.00	2075.00	2075.00	2075.00	2075.00	2075.00	4150.00
83	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	4200.00
84	2125.00	2125.00	2125.00	2125.00	2125.00	2125.00	4250.00
85	2150.00	2150.00	2150.00	2150.00	2150.00	2150.00	4300.00
86	2175.00	2175.00	2175.00	2175.00	2175.00	2175.00	4350.00
87	2200.00	2200.00	2200.00	2200.00	2200.00	2200.00	4400.00
88	2225.00	2225.00	2225.00	2225.00	2225.00	2225.00	4450.00
89	2250.00	2250.00	2250.00	2250.00	2250.00	2250.00	4500.00
90	2275.00	2275.00	2275.00	2275.00	2275.00	2275.00	4550.00
91	2300.00	2300.00	2300.00	2300.00	2300.00	2300.00	4600.00
92	2325.00	2325.00	2325.00	2325.00	2325.00	2325.00	4650.00
93	2350.00	2350.00	2350.00	2350.00	2350.00	2350.00	4700.00
94	2375.00	2375.00	2375.00	2375.00	2375.00	2375.00	4750.00
95	2400.00	2400.00	2400.00	2400.00	2400.00	2400.00	4800.00
96	2425.00	2425.00	2425.00	2425.00	2425.00	2425.00	4850.00
97	2450.00	2450.00	2450.00	2450.00	2450.00	2450.00	4900.00
98	2475.00	2475.00	2475.00	2475.00	2475.00	2475.00	4950.00
99	2500.00	2500.00	2500.00	2500.00	2500.00	2500.00	5000.00
100	2525.00	2525.00	2525.00	2525.00	2525.00	2525.00	5050.00



It will be noted that cost of operation was heavier for Camp 1 than for Camp 2. This is accounted for largely by the fact that the forestry men in Camp 2 were loaned to the Potlatch Timber Protective Association for two weeks to assist in fire suppression during an emergency and were paid salary and subsisted by the Association for that period. More chemical was used in Camp 1 than was used in Camp 2.

B. Cost of Irrigating Ridges from Stream Type of Camp 2.



TABLE NO. 4.

## COST OF ERADICATION

Camp Number	Cost of Hand Eradication			Cost of Chemical Eradication			Cost of Combined Eradication		
	Acreage	Cost	Cost Per Acre	Acreage	Cost	Cost Per Acre	Acreage	Cost	Cost Per Acre
1	1,041.7	\$ 8,255.56	\$7.92	76.1	\$1,844.76	\$24.24	1,117.8	\$10,100.32	\$9.04
(Infected Area)	300.0	692.00	2.30				300.0	692.00	2.30
2	1,576.3	7,441.68	4.72	105.3	2,393.88	22.73	1,681.6	9,835.46	5.86
Averages & Totals	2,918.0	\$16,389.24	\$5.60	181.4	\$4,233.64	\$23.36	3,009.4	\$20,627.78	\$6.65



10. 01. 1961

COMPTON CORPORATION

[illegible]



The average cost per acre for the 57,010 acres protected by stream type eradication was \$0.36. The 57,010 acres represent the area on which Ribes were eradicated from stream type and is explained in the general statement "Ribes Eradication in North Idaho".

In the report sent to the Potlatch Timber Protective Association at the end of the 1929 field season the total cost of the operation was given as \$30,000.00. This charge was justified by the necessity of carrying a skeleton supervisory organization the full year. Furthermore, considerable expense is involved for miscellaneous supplies, warehousing, equipment overhauling, etc. Considering \$30,000.00 as the total cost of Ribes eradication on the Potlatch Timber Protective Association for the year May 1, 1929 to April 30, 1930, the average cost for protecting each acre of white pine timber within the protection zone was \$0.53.

#### G. Cost of the Meals Served in the Eradication Camps.

TABLE NO. 5  
COST OF MEALS.

Camp No.	Cooking Salary	Cost of Food	Transportation of Food	Total Subsistence Cost	Number of Meals	Average Cost Per Meal
1	\$ 549.68	\$1,951.19	\$471.36	\$2,972.23	6,241	\$0.4764
2	528.88	1,687.58	478.66	2,695.12	5,299	0.5184
Total	\$1,078.56	\$3,638.77	\$950.02	\$5,667.35	11,540	\$0.4911

#### D. Checking the Effectiveness of Ribes Eradication.

Checking to determine the effectiveness of Ribes eradication as a control measure was undertaken by the personnel of Project 4. A report on the results follows this report. The cost of checking, \$750.00 is a necessary item of the cost of Ribes eradication and is reflected or shown in the statements in Tables 3 and 4.

#### E. Ribes Eradication on the Area Infected with Blister Rust.

The discovery of a center of pine infection at the mouth of Three Bear Creek in township 39 N., range 1 E., Boise Meridian made necessary eradication of Ribes from the entire area on which infected pines were found plus a protective boundary. This resulted in the



The average cost per acre for the 57,010 acres protected by stream type eradication was \$0.86. The 57,010 acres represent the area on which Ribes were eradicated from stream type and is explained in the general statement "Ribes eradication in North Idaho".

In the report sent to the Potlatch Timber Protective Association at the end of the 1939 field season the total cost of the eradication was given as \$30,000.00. This charge was justified by the necessity of carrying a skeleton supervisory organization the full year. Furthermore, considerable expense is involved for miscellaneous supplies, transportation, equipment overhauling, etc. Considering \$30,000.00 as the total cost of Ribes eradication on the Potlatch Timber Protective Association for the year May 1, 1939 to April 30, 1940, the average cost for protecting each acre of white fir timber within the protection zone was 0.53.

6. Cost of the Meals Served in the Eradication Camps.

TABLE NO. 5  
COST OF MEALS.

Camp No.	Cooking Salary	Cost of Food	Transportation	Total Subst-	Number of Meals	Average Cost per Meal
1	\$42.38	\$1,351.13	\$471.30	\$1,864.81	1,841	\$1.01
2	\$32.38	\$1,527.53	\$48.86	\$1,618.77	1,523	\$1.06
Total	\$1,072.56	\$2,878.66	\$520.16	\$4,471.38	3,364	\$1.33

7. Checking the Effectiveness of Ribes Eradication.

Checking to determine the effectiveness of Ribes eradication was a control measure was undertaken by the personnel of Project 4. A report on the results follows this report. The cost of checking, \$450.00 is a necessary item of the cost of Ribes eradication and is reflected or shown in the statements in Tables 3 and 4.

8. Ribes Eradication on the Area Infected with Blister Rust.

The discovery of a center of pine infection at the mouth of Three Bear Creek in Township 39 N., Range 1 W., Boise National Forest necessary eradication of Ribes from the entire area in which infected pines were found pins a protective boundary. This resulted in the



working of 300 acres not classed as stream type. The acreage so worked is shown separately as "infected area" in Table 4 and as "dense pole" in Table 1.

#### RECOMMENDATION FOR FUTURE WORK

There is a consensus of opinion in favor of smaller stream type eradication units. Working only the stream type results in necessity of frequent moves. Fewer men employed per camp would result in less frequent moving of the camp and permit using more mobile equipment.



working of 300 acres not cleared as shown here. The acreage so cleared is shown separately as "cleared area" in Table 1 and as "total cleared" in Table 2.

#### RECOMMENDATIONS FOR FUTURE WORK

There is a consensus of opinion in favor of making stream type studies. Working only the stream type results in a more complete picture of the stream type. Fewer men employed per camp would result in less expense. Stream type studies are being made in the future.





W.748-Concentration of Ribes petiolare before spraying.



W.740-Ribes petiolare concentration two weeks after being sprayed showing dead leaves and twigs.







RESULTS OF CHECKING ON THE AREAS ERADICATED OF RIBES  
IN THE POTLATCH TIMBER PROTECTIVE ASSOCIATION,  
IDAHO - 1929.

By  
H. N. Putnam,  
Associate Pathologist.

Streams eradicated in 1929 in the East Fork of Potlatch Creek, Gold Creek, Deep Creek and Meadow Creek drainages were satisfactorily checked in 1929.

Tables Nos. 1 and 2 show the results of checking these areas by means of permanent and temporary check plots.

REPORT ON THE RESULTS OF CHECKING ON THE AREAS  
THE POTLATCH TIMBER PROTECTION DISTRICT  
IDAHO - 1929

By  
H. N. Putnam  
Associate Pathologist

Streams eradicated in 1929 in  
Creek, Deep Creek and Meadow  
checked in 1929.

Tables Nos. 1 and 2 show the  
of permanent and temporary



RESULTS OF CHEMICAL ANALYSIS OF THE SOILS OF THE  
IN THE FORESTED AREA OF THE

1921 - 1922

19

U. S. FOREST SERVICE

Forest Research Station

Stems collected in 1921 in the form of sections  
 Green, Gold, Red, and Yellow Green (hardly) some  
 actually covered in 1922.

Tables Nos. 1 and 2 show the results of chemical  
 analyses by means of permanent and temporary means.



TABLE NO. 1.

RESULTS OF CHECKING ERADICATED AREAS OF POTLATCH TIMBER PROTECTIVE ASSOCIATION, IDAHO  
BY PERMANENT PLOTS - 1929.

Streams	Eradication Status	Number Plots	% Concentration			Ribes Feet Live Stem per Acre			Per Cent of Efficiency by Live Stem
			Area Containing Ribes	Actual Area of Ribes	R. petiolare	R. inerme	R. lacustre	Total	
East Fork, Potlatch Creek and Mallory Creek	Before erad.	20	24.8	11.0	60,056	19	36,476	96,551	
	After erad.	13	-	-	192	11	391	594	99.4
Deep Creek	Before erad.	24	7.1	3.5	9,087	407 (R. irrig.)	4,035	13,529	
	After erad.	18	-	-	22	0	290	312	97.7
Gold Creek	Before erad.	3	38.7	19.5	60,964	0	66,667	127,631	
	After erad.		Not checked on account of sheep having eaten foliage.						



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# OFFICIAL



TABLE NO. 2.

RESULTS OF CHECKING ERADICATED AREAS OF POTLATCH TIMBER PROTECTIVE  
ASSOCIATION, IDAHO, BY TEMPORARY PLOTS, 1929.

A r e a	Plots	Number Milacres	Ribes Per Acre After Eradication							
			R. petiolare Bushes F.L.S.	R. viscosissimum F. L. S. Bushes	R. lacustre F.L.S. Bushes	R. lacustre F.L.S. Bushes	Total Ribes Bushes F.L.S.			
East Fork, Potlatch Creek and Mallory Creek	964	19,852	1	11	0	19	674	20	685	
	353	11,200	1	14	0	18	259	19	273	
Deep Creek	406	9,822	0	0	0	19	237	19	237	
Meadow Creek	16	1,820	0	0	7	85	22	145	29	230
Long Meadow Creek										
Infection Area	558	20,214	1	70	0	21	432	22	502	
Gold Creek										



RECEIVED: 1940, 14 FEBRUARY 1941, 1942, 1943.  
RECEIVED: 1940, 14 FEBRUARY 1941, 1942, 1943.  
RECEIVED: 1940, 14 FEBRUARY 1941, 1942, 1943.



The large amount of *Ribes* per acre, 127,631 feet of live stem, as shown in Table No. 1 on Gold Creek before eradication, is not at all representative of average conditions. The three plots on which this figure is based, are located in the region of greatest *Ribes* abundance.

In Table No. 1 there may be noted an example of the fallacy of using a per cent efficiency as a measure of effectiveness. On the East Fork of Potlatch Creek there were *Ribes* left at the rate of 594 feet of live stem per acre, with an efficiency of 99.4 per cent while on Deep Creek there were but slightly more than half the number of feet of live stem per acre, with a 1.7 per cent less efficiency.

Tables No. 1 and 2 show similar results on the same areas checked. In every case the largest bulk of *Ribes* left consisted of *Ribes lacustre*. Larger amounts of *R. petiolare* were left on the areas checked by permanent plots than on those checked by temporary plots, because in the former case the areas checked were limited to the main streams where *R. petiolare* occurred in greatest abundance.

Table No. 2 shows a quite consistent uniformity in bushes and feet of live stem left. There are three areas on which the feet of live stem varied only from 230 to 273 per acre. It is interesting to note that the amount of *Ribes* per acre left on the upland type on the Long Meadow infection area is similar to the amounts left on the stream types of Deep and Meadow Creeks. This fact suggests the possibility of the existence of a practical minimum amount of *Ribes* left after eradication, a further reduction of which would materially increase the cost of eradication.

Strictly from the eradication viewpoint there was a high degree of efficiency of work obtained, and a good job performed. That the results of eradication will be, expressed in effectiveness of control, remains to be determined. Opportunity is afforded for a study of effectiveness of control on two areas where pine infection was found and where eradication work took place. These locations are: (1) Deep Creek, and (2) Long Meadow Creek.







## SCOUTING FOR BLISTER RUST IN NORTHERN IDAHO, 1929

by

E. L. Joy

Junior Forester

### INTRODUCTION

In 1927 blister rust was discovered in Idaho for the first time about seven miles north of Priest River. In 1928 the disease was found to be spread over the entire Inland Empire white-pine belt and to be well established in the southern part of this region, that portion just north of the Clearwater River. Consequently, most of the scouting work in 1929 was done in this southern region.

### PURPOSE

The purpose of scouting, as in the past, was primarily to determine the extent and intensity of the disease. Work started in 1928, toward a survey of all stream-type in the white-pine belt containing Ribes petiolare and R. inerme was continued in conjunction with scouting.

### LOCATION OF WORK

The lands of the Clearwater and Potlatch Timber Protective Associations and the Clearwater National Forest were the regions most intensively scouted. Some scouting was done on the St. Joe National Forest and a scouting trip was made in the Priest River portion of the Kaniksu National Forest where infection was found in 1927 and 1928.

### ORGANIZATION OF WORK

#### A. Spring Scouting.

In an effort to locate pine infection in the St. Maries River drainage near Clarkia, Idaho, where abundant infection on Ribes was found in 1928, a scouting trip was made in May. Four members of the permanent personnel spent two days examining pines in this area.

#### B. Summer and Fall Scouting.

1. Personnel. Scouting in the summer and fall of 1929 was combined with two other projects, namely, "Checking of Eradication" and



## SCOUTING FOR BLISTER BEETLE IN THE WESTERN REGION, 1932

by  
E. L. Joy  
Junior Forester

### INTRODUCTION

In 1937 blister beet was discovered in bluffs for the first time about seven miles north of Priest River. In 1938 the disease was found to be spread over the entire bluffs and the white-pine belt was well established in the southern part of this region, that portion north of the Clearwater River. Consequently, most of the scouting work in 1938 was done in this northern region.

### PURPOSE

The purpose of scouting, as in the past, was primarily to determine the extent and intensity of the disease. Work started in 1938, toward a survey of all stream-type in the white-pine belt containing blister beetles. R. Joy was confined in cooperation with scouting

### LOCATION OF WORK

The lands of the Clearwater and Pollock Timber Production Associations and the Clearwater National Forest were the primary work intensively scouted. Some scouting was done on the St. Joe National Forest and a scouting trip was made in the Priest River section of the Lemhi National Forest where infection was found in 1937 and 1938.

### ORGANIZATION OF WORK

#### A. Spring Scouting

In an effort to locate the infection in the St. Joe National Forest, near Clarkia, Idaho, a permanent inspection was made in 1938, a scouting trip was made in July. Some work was done in this area, the permanent personnel spent two weeks examining bluffs in this area.

#### B. Summer and Fall Scouting

I. Personnel. Scouting in the summer and fall of 1938 was done with two other projects, namely, "Scouting of Infection"



"Disease Studies", all of which were under the supervision of H. N. Putnam, E. L. Joy, A. E. Myers and eight temporary assistants completed the personnel for these projects. Three of the temporary assistants were not used for the entire field season. In addition, scouting was done by members of other projects and a report of this made at the end of the season.

2. Division of Time. During the summer months all men engaged in checking or plot study work scouted in conjunction with this work. Several days during the season were spent on scouting trips in order to keep up the scouting interest. All temporary men were given an opportunity to see the disease on both hosts during the summer.

In the early fall after the checking and plot study work were completed the force devoted its entire time to scouting. Two-man crews were used, each crew having a car.

3. Methods of Work. Stream-type in which R. petiolare and R. inerme are in association with white pine is considered the most favorable scouting chance. This type of area was given chief consideration and scouted intensively by drainages. Emphasis was placed on pine scouting in order to locate as many centers of infection as possible, this information being of great importance in making eradication plans.

The Ribes along the stream and the pines in close association were examined. Particular attention was paid to areas on which infection had been found in previous years.

4. Recording of Data. The two scouting forms previously used, numbers 57 and 38, were used in 1929. Form number 57 is used for a summary report of the scouting performed on a drainage or part of a drainage called an "inspection". Space is provided for recording the width of stream-type and the abundance, number examined and number infected of pines and of Ribes by species.

Form 38 is designed for the recording of data for each infection. It is divided into three parts, the first for the individual pine infection data, the second for the analysis of the pine cankers found and the third for a detailed analysis of the infection found on Ribes.

Both forms have spaces for such information as the location of the area, the inspector's name and the date of inspection. A space



"Disease Studies," all of which were under the supervision of Dr. J. L. Joy, A. M. Myers and eight temporary assistants completed the project. Those of the temporary assistants were not used for the entire field season. In addition, a number of members of other projects and a report of this work at the end of the season.

2. Division of Time. During the summer months all men engaged in checking or field study work counted in conjunction with this work. Several days during the season were spent on account of rain in order to keep up the accounting interval. All temporary men were given an opportunity to see the disease on both hosts during the season.

In the early fall after the checking and field study work were completed the forms devoted to the entire time to accounting. The forms were read, each after having a call.

3. Methods of Work. Street-type in which the host is in association with the virus is considered the most favorable accounting chance. This type of work was given chief consideration and accounted intensively by the host. Emphasis was placed on this method in order to locate as many centers of infection as possible, this information being of great importance in determining the source of infection.

The types along the stream and the river in close association were examined. Particular attention was paid to areas of high infection had been found in previous years.

4. Recording of Data. The two counting forms previously mentioned, numbers 25 and 26, were used in 1929. Form number 25 is used for a summary report of the accounting interval on a disease or set of diseases called an "infection." Form 26 is provided for recording the width of stream-type and the abundance, number examined and whether infected of vines and of hosts of species.

Form 25 is designed for the recording of data for each infection. It is divided into three parts, the first for the individual vine infection data, the second for the analysis of the vine counts found and the third for a detailed analysis of the infected vines and Ribes.

Both forms have spaces for such information as the location of the vine, the inspector's name and the date of inspection. A space







is also provided for a rough sketch map of the area on which can be shown by a color scheme the area supporting the following: 1. In the and white pine and the location of each infection.

### RESULTS OF SCOUTING

#### A. Combined Results.

The results of scouting done by all projects during the 1939 season have been combined. Following are two tables which show the results of scouting in northern Idaho, Table No. 1 being by counties of all work done and Table No. 2 a detailed account of each infection found.



TABLE NO. 1  
SUMMARY OF SCOUTING IN NORTHERN IDAHO, 1929

County	No.		R. petiolare		R. inerme		R. irriguum		R. visco.		R. lacustre		Total		pines	
	Insp.	Inf.	Exam.	Inf.	Exam.	Inf.	Exam.	Inf.	Exam.	Inf.	Exam.	Inf.	Exam.	Inf.	Exam.	Inf.
Clearwater	19	9	12,335	34	1,615	0	60	6	774	12	1,498	38	16,282	90	11,955	20
Shoshone	13	5	20,330	20	515	0	0	0	30	0	1,250	0	23,125	20	6,420	40
Latah	2	2	576	1	551	1	0	0	0	0	602	0	1,729	2	85	0
Bonner	4	0	0	0	2,310	0	0	0	0	0	150	0	2,460	0	920	0
Kootenai	1	0	0	0	200	0	0	0	0	0	0	0	200	0	500	0
Total	39	16	33,241	55	5,191	1	60	6	804	12	3,500	38	42,796	112	19,880	60







SUMMARY OF INFECTIONS IN NORTHERN IDAHO, 1929

Location	Species	Ribes		Per Cent Leaves Infected Per Infected Bush	Pines		Year Origin of Infection
		Examined	Infected		Examined	Infected	
North Fork Headwaters Creek 1 1/2 miles below Headquarters, Idaho. Clearwater County T. 38 N., R. 5 E., Sec. 15.	R. petiolare. R. lacustris.	25 0	0 0	0 0	500	15	1927
Rhodes Creek for 30 chains above old gold dredge, Pierce, Idaho. Clearwater County T. 35 N., R. 5, E., Sec. 15.	R. petiolare. R. incense.	20 5	18 0	40 0	2,000	0	
Orofino Creek 1/2 mile below old gold dredge, Pierce, Idaho. Clearwater County T. 35 N., R. 5 E., Sec. 13.	R. petiolare. R. lacustris.	500 25	1 0	1 0	150	0	
North Fork Washington Creek 55 chains below trail crossing, Headquarters, Idaho. Clearwater County T. 38 N., R. 5 E., Sec. 20.	R. petiolare. R. lacustris.	500 500	2 1	10 5	200	0	
Casey Creek 1/2 mile above Casey Meadows, Headquarters, Idaho. Clearwater County T. 38 N., R. 5 E., Sec. 5.	R. petiolare. R. lacustris.	500 25	1 0	5 0	100	0	
Beaver Creek 300 feet above Clearwater Timber Co. Camp 9, Headquarters, Idaho. Clearwater County T. 39 N., R. 5 E., Sec. 12.	R. petiolare. R. lacustris.	100 500	1 0	5 0	100	0	
Long Meadow Creek 1/2 mile above mouth Road Meadow Creek, Elk River, Idaho. Latah County T. 39 N., R. 1 E., Sec. 9.	R. lacustris. R. lacustris.	500 500	0 1	0 1	1,000	0	
Long Meadow Creek at mouth 3 Bear Creek, Elk River, Idaho. Clearwater County T. 39 N., R. 1 E., Sec. 14.	R. lacustris. R. viscosissimum R. irriguum R. viscosissimum R. lacustris.	78 12 100 50 12 20	36 10 10 6 2 2	60 75 5 20 0.2	51 pines infected over area except 2 centers where 95% pines infected	1923	
Fresh Creek 3 1/2 miles south Oxford Ranger Station, Pierce, Idaho. Clearwater County T. 37 N., R. 7 E., Sec. 7.	R. petiolare.	50	1	0.2	30	0	
Middle Fork St. Maries River, Clarkia, Idaho. Inspection No. 1. Shoshone County T. 42 N., R. 2 E., Sec. 3, 10.	R. petiolare. R. lacustris. R. petiolare. R. incense.	1,800 150 750 110	4 0 1 0	10 0 1 0	600	1	1923
Middle Fork St. Maries River, Clarkia, Idaho. Inspection No. 2. Shoshone County T. 42 N., R. 2 E., Sec. 8.	R. lacustris. R. lacustris. R. petiolare. R. lacustris.	230 5,000 430 2,000	0 4 1 0	0 2 2 0	650	7	1923
East Fork Merry Creek, Clarkia, Idaho. Shoshone County T. 43 N., R. 2 E., Sec. 34.	R. lacustris. R. lacustris.	430 2,000	0 1	2 0	960	0	
Merry Creek near mouth East Fork, Clarkia, Idaho. Shoshone County T. 43 N., R. 2 E., Sec. 33.	R. petiolare. R. lacustris.	200 3,100	0 10	0 15	70	0	
Cold Center Creek and Middle Fork St. Maries River near mouth Cold Center Creek, Clarkia, Idaho. Shoshone County T. 42 N., R. 2 E., Sec. 11.	R. petiolare. R. lacustris. R. incense.	200 51 50	0 1 0	0 25 0	1,200	32	1923
West Fork Potlatch Creek 7.3 miles northeast of Bowll, Idaho on road to Clarkia, Idaho. Blatch County T. 42 N., R. 1 E., Sec. 32.	R. lacustris.	1 2	0 0	0 0	60	0	







## B. Details of Pine Infection Centers.

Four new pine infection centers were found during the 1929 season. A detailed report of each follows:

### 1. Name: North Fork Reed's Creek Infection.

Location: 1 $\frac{1}{2}$  miles west of Headquarters, Idaho on North Fork Reed's Creek, township 38 north, range 5 east, section 16.

Inspectors: C. Chapman, E. L. Joy, H. N. Putnam. September 4, 1929.

Pine inspection: Scattered young pines are growing in the stream type between stands of mature pine. R. petiolare was abundant before eradication in 1929. A total of 500 trees was examined, 15 of which were infected with a total of 23 cankers. No cankers were fruiting in 1929, the infection having originated in 1927. The infected trees were removed at the request of officials of the Clearwater Timber Protective Association.

Ribes inspection: The eradication crews had worked this area a few days before this infection was found making the examination of Ribes difficult. No infection was found on either the sprayed bushes or those that were still succulent because of insufficient spray.

Remarks: This was the only pine infection found on the Clearwater Timber Protective Association holdings and the only one of 1927 origin located in northern Idaho.

### 2. Name: Deep Creek-Elk Creek Infection.

Location: At the junction of Deep and Elk creeks 3 miles south of Elk River, Idaho, township 39 north, range 2 east, section 11.

Inspectors: E. L. Joy, R. K. Pierson, H. N. Putnam, F. F. Staat, F. Joy and C. M. Chapman. July 6, 1929.

Pine inspection: A scattered stand of young pines is growing along the streams on a dry rocky site. About 500 pines were examined and 5 found infected with one canker each, 3 of 1923 and 2 of 1927 origin. The infected trees are scattered along both streams for a total of 1/2 mile. Infection in this area originated in 1923.

Ribes inspection: Heavy Ribes infection was found in this vicinity in 1923 but no infected pines could be located. Heavy Ribes infection was again found in 1929. Four species on this area, R. petiolare, R. irriguum, R. viscosissimum and R. lacustre were all infected.

Remarks: No explanation can be given as to why this infection did not intensify more during the 1927 wave of infection. Ribes occur in abundance and pines grow in close association. The Ribes were eradicated from this area in 1929.



### 3. Details of pine infection centers.

Four new pine infection centers were found during the 1937 season. A detailed report of each follows:

#### 1. Name: North York Head's Creek Infection.

Location: 1/2 mile west of Headquaters, Main road north of Reed's Creek, township 18 north, range 8 east, section 11.

Inspector: E. J. Joy, H. W. Chapman, July 8, 1937.

Pine infection: scattered along road and growing in open type between stands of mature pine. A significant amount of infection in 1937. A total of 300 trees were estimated to be infected with a total of 1000 cones. The infection was first removed at the request of officials of the Timber and Pulp Association.

Notes: This is a new infection and was found a few days before this infection was found. The infection was found in the same place as the 1937 infection. No infection was found in 1937. Those that were still present at the time of the 1937 infection.

Remarks: This was the only pine infection found in the Greenway Timber Protective Association infection in 1937. 1937 origin located in northern 1937.

#### 2. Name: Deep Creek Infection.

Location: At the junction of Deep Creek and the main road of the river, 1/2 mile north of the mouth, range 8 east, section 11.

Inspector: E. J. Joy, H. W. Chapman, July 8, 1937.

Pine infection: scattered along road and growing in open type between stands of mature pine. A significant amount of infection in 1937. A total of 300 trees were estimated to be infected with a total of 1000 cones. The infection was first removed at the request of officials of the Timber and Pulp Association.

Notes: This is a new infection and was found a few days before this infection was found. The infection was found in the same place as the 1937 infection. No infection was found in 1937. Those that were still present at the time of the 1937 infection.

Remarks: This was the only pine infection found in the Greenway Timber Protective Association infection in 1937. 1937 origin located in northern 1937.



3. Name: Long Meadow Creek Infection.

Location: On Long Meadow Creek and 3 Bear Creek at the mouth of 3 Bear Creek 7 miles southwest of Elk River, Idaho; 6 miles due west of the Deep Creek-Elk Creek infection, township 39 north, range 1 east, section 14.

Inspectors: C. M. Chapman, R. K. Pierson, E. L. Joy, H. N. Putnam and crew. August 21, 1929.

Pine inspection: A dense stand of 20-40-year old white pine is growing on the slope west of Long Meadow Creek and along both slopes in the 3 Bear Creek drainage. The slope east of Long Meadow Creek is rocky and dry with only scattered trees on it.

A very large pine infection area was found here probably of 1923 origin. Many fruiting cankers of 1923 and 1926 origin and a heavy crop of 1927 cankers were found. It is estimated that the infected area is about 60 acres in extent and that there are approximately 4,500 infected trees.

Ribes inspection: R. lacustre and R. viscosissimum were the only species found on this area or in the immediate vicinity and 93½ per cent of these were R. lacustre. Both species were infected and showed a considerable amount of intensification. The telia produced on R. lacustre were exceptionally well developed for this species.

Remarks: The two streams flow through a rocky canyon. Apparently this is an area of high humidity during the summer.

Eradication of the Ribes was in progress when the infection was found. 300 acres of timbered land around the infection were eradicated of Ribes to check the intensification of the disease on the pines.

4. Name: St. Maries River Infection.

Location: Above Clarkia, Idaho along the St. Maries River, township 42 north, range 2 east, sections 8, 9, 10, 11.

Inspectors: F. Joy, R. Joy, R. E. Myers, O. Luke. September 3, 1929.

Pine inspection: A dense stand of 20-40-year old white pine borders the river and its tributaries in this region. Infection was found on pines for a distance of 1½ miles along the river. This infection is of 1923 origin with a heavy wave of 1927 cankers showing. Only one fruiting canker was found.

Ribes inspection: The stream-type in this region is wide with heavy concentrations of R. petiolare in it. This affords an excellent chance for intensification of the disease. Many of these bushes were found to be infected. R. lacustre, also abundant in the stream type, was not infected.







Remarks: Scouting on pines was done in this drainage in May, 1929 but no cankers could be located. This bears out other scouting observations which have shown that young cankers are very obscure in the early spring.

An analysis of the existing conditions on these four areas is shown in the following table:

TABLE NO. 3

RIBES ABUNDANCE AND PINE CANKERS AT INFECTION CENTERS

Area	Ribes Abundance: Light, Medium, Heavy					Cankers Originating	
	R. ret.	R. iner.	R. irrig.	R. vis.	R. lac.	In 1923	Since 1923
N. Fork Reed's Creek	H	O	O	O	M	0	22
Deep Creek-Elk Cr.	M	O	L	L	L	3	2
Long Meadow Creek	O	O	O	L	L	5	123
St. Maries River	H	M	O	O	L	1	93

C. Discussion.

Of the 39 inspections in northern Idaho 34 were in the regions which form the southern part of the commercial-white-pine belt. An abundance of R. petiolare is found in association with white pines in this region making the blister-rust hazard extremely great. The probability of establishment of the disease on this very susceptible Ribes species and associated pines is high and the possible damage resulting from this infection great. Therefore control of the disease in this region by stream-type eradication is of immediate importance and the locating of all infection centers necessary in planning this control.

16 infection centers were located on 9 major drainages in this region. These are scattered over the southern edge of the white-pine belt and in all cases are in or adjacent to excellent stands of white pine. Pine infection was found on 4 of these drainages and in all probability is established on every large drainage in this region.



Remarks: Counting on flies was done at this station in 1937. 1938 but no cankers could be located. This means that other counting observations which have shown that young cankers are very obscure in the early spring.

An analysis of the existing conditions on these four areas is shown in the following table:

TABLE NO. 3

FLIES, BOUNDARY AND FLY CANKERS IN INSECTIONS OF THE

Cankers	In	In	Flies abundance: 1st, 2nd, 3rd, 4th				Total	Remarks
			1st	2nd	3rd	4th		
St. Lawrence River	0	0	0	0	0	0	0	
Long Meadow Creek	0	0	0	0	0	0	0	
Deep Creek - W. Cr.	0	0	0	0	0	0	0	
St. Lawrence Creek	0	0	0	0	0	0	0	

C. Discussion.

Of the 39 infections in northern I saw at one in the region which form the southern part of the commercial-white-pine belt. In abundance of *A. reticulatus* is found in association with white pine in this region making the blister-rust hazard extremely great. The possibility of establishment of the disease or this very successful flies and associated flies is high and the life span resulting from this infection great. Therefore control of the disease in this region by stream-type eradication is of immediate importance and the location of all infection centers necessary in this control.

16 infection centers were located on 9 major drainages in the region. These are scattered over the southern edge of the white-pine belt and in all cases are in adjacent to excellent stands of white pine. Fine infection was found on 4 of these drainages and in all probability is established on every large drainage in this region.



The 5 inspections made on the Kaniksu National Forest, where B. inermis is the susceptible species in abundance, did not reveal any infection. Infection had been found in this region both in 1927 and 1928.

#### COSTS

The following table shows the cost of this project in 1929.

TABLE NO. 4

#### COST OF PROJECT 4.12, SCOUTING IN IDAHO, 1929

Item	Cost	Per Cent Total
Salaries	\$1,120.50	68.79
Subsistence	278.99	17.13
Personal Auto	212.59	13.05
Other Travel	13.64	.84
Miscellaneous	3.05	.19
Total	\$1,628.77	100.00

#### CONCLUSION

Although scouting in northern Idaho in 1929 was not as extensive as in 1928, the work was done in the region where heavy infection was found in 1928 and where conditions are extremely favorable for the establishment and spread of the disease. Here, also, are very valuable stands of white pine in which most of the eradication work is being done and because of this a disease survey is necessary.

The disease was found widely distributed over the southern portion of the white-pine belt and pine infections located indicate that the disease is well established in this area. Its size and inaccessibility make it impossible to scout intensively a very large per cent of the region.



The 3 inspectors have in the past been successful in detecting and reporting the spread of the disease in the region. The following table shows the results of their work in the region both in 1937 and 1938.

### TABLE

The following table shows the results of their work in the region both in 1937 and 1938.

### TABLE

RESULTS OF THE WORK OF THE 3 INSPECTORS IN THE REGION BOTH IN 1937 AND 1938

Year	Number of cases	Number of deaths
1937	1,150	1,150
1938	1,150	1,150
Total	2,300	2,300

### DISCUSSION

Although the disease is not a new one in the region, it has been reported as being more extensive in 1938 than in 1937. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table.

The disease was found to be more extensive in 1938 than in 1937. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table. The results of the work of the 3 inspectors in the region in 1937 and 1938 are shown in the table.



BLISTER-RUST-CONTROL WORK IN WASHINGTON  
1929

Blister-rust-control work in Washington was carried on, as in the past, as a cooperative project between the Washington State Department of Agriculture and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was made effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1927

Between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
WASHINGTON STATE DEPARTMENT OF AGRICULTURE

Cooperative Work in Controlling White Pine Blister Rust in  
WASHINGTON

\* \* \* \* \*

Paragraph C-6, of the Memorandum of Understanding described above contains the following:

"For the Fiscal Year 1928, the Bureau of Plant Industry shall contribute in value approximately \$13,000 to the support of this cooperative work, and the Washington State Department of Agriculture shall contribute in value approximately \$8,000; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provision, it is mutually agreed that for the fiscal year ending June 30, 1930 there will be contributed in value by the Washington State Department of Agriculture approximately \$8,000, and by the United States Department of Agriculture Bureau of Plant Industry, thru its Office of Blister Rust Control approximately \$10,800 in connection with cooperative blister-rust control work in Washington.

Date:

Signature:

8/8/29

(s) Erle J. Barnes

Director, Washington State Dept. of Agriculture

8/19/29

(s) Wm. A. Taylor

Chief, Bureau of Plant Industry



PLANT-INDUSTRY CO-OPERATIVE WORK IN WASHINGTON  
1937

Plaster-trust control work in Washington was carried out, as in the past, as a cooperative project between the Washington State Department of Agriculture and the Bureau of Plant Industry. The latter memorandum of understanding upon which this work was organized was made effective July 1, 1937 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1938, beginning July 1, 1937:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1937

Between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
WASHINGTON STATE DEPARTMENT OF AGRICULTURE

Cooperative work in controlling white pine blister rust in  
WASHINGTON  
\* \* \* \* \*

Paragraph C-6, of the Memorandum of Understanding referred to above contains the following:

"For the fiscal year 1938, the Bureau of Plant Industry shall contribute in value approximately \$13,000 to the support of this cooperative work, and the Washington State Department of Agriculture shall contribute in value approximately \$3,000; hereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provision, it is mutually agreed that for the fiscal year ending June 30, 1938 there will be contributed in value by the Washington State Department of Agriculture approximately \$8,000, and by the United States Department of Agriculture approximately \$10,000 in connection with cooperative blister-trust control work in Washington.

Witness:  
Date: 8/2/37

(s) Eric J. Barnes  
Director, Washington State Department of Agriculture

(s) W. A. DeVlor  
Chief, Bureau of Plant Industry



## SCOUTING FOR BLISTER RUST IN WASHINGTON, 1929

By

E. L. Joy,  
Junior Forester.

### INTRODUCTION

Blister rust was first found in Washington near Mt. Vernon in 1921. Since this discovery the disease has been found throughout the Cascade and Olympic Mountains of Washington and in the northeast part of the state, a region adjacent to the Inland Empire white-pine belt. Because the disease is so widespread in the western part of the state, no scouting was done there.

### PURPOSE

The purpose of this scouting was to determine the extent and intensity of the disease.

### LOCATION OF WORK

All 1929 scouting was done in the northeast part of the state in Pend Oreille County. This region is west of and adjacent to the Pend Oreille River.

### PERSONNEL

A three-day trip was made through this region and scouting done by H. N. Putnam, F. F. Staat and R. K. Pierson.

### RESULTS

A total of 11 inspections was made in this region. At none of these points was infection found on either host. The following is an account of the number of Ribes and pines examined:

<u>Ribes inerme</u>	-	-	216
<u>R. viscosissimum</u>	-	-	797
<u>R. lacustre</u>	-	-	295
White pines	-	-	508

### COSTS

An analysis of the costs of this project is shown in the following table:



By  
M. L. Joy,  
Junior Forester.

# INTRODUCTION

Hister was first found in Washington State in 1931. Since this discovery the disease has been found throughout the Cascade and Olympic Mountains of Washington and in the northwest part of the state, a region adjacent to the Idaho border. Because the disease is at its worst in the eastern part of the state, no scouting was done there.

## PURPOSE

The purpose of this scouting was to determine the extent and intensity of the disease.

## LOCATION OF WORK

All 1931 scouting was done in the northwest part of the state in Grant and Kootenai Counties. This region is west of and adjacent to the Idaho border. The Kootenai River.

## METHODS

A three-day trip was made through this region and scouting was done by M. L. Joy, W. A. Stewart and P. K. Stewart.

## RESULTS

A total of 11 inspections was made in this region. At none of these points was infection found on either host. The following is an account of the number of sites and trees examined:

White pines	-	-	-	215
R. ponderosa	-	-	-	177
R. laevis	-	-	-	225
White pines	-	-	-	225

## DISCUSSION

An analysis of the cases of this insect is shown in the following table:



TABLE NO. 1.

## COSTS OF SCOUTING IN WASHINGTON - 1929

Item	Amount	Per Cent
Salaries	\$330.89	89.94
Subsistence	16.30	4.43

Item	Amount	Per Cent
Salaries	\$330.89	89.94
Subsistence	16.30	4.43
Transportation	20.29	5.51
Miscellaneous	.42	.12
Total	\$367.90	100.00



TABLE NO. 1

COSTS OF SCOUTING IN WASHINGTON - 1963

Item	Amount	Per Cent
Salaries	\$230.33	92.34
Supplies	16.30	4.43
Transportation	25.33	6.33
Miscellaneous	45.00	11.90
Total	\$317.00	100.00



BLISTER-RUST-CONTROL WORK IN OREGON

1929

Blister-rust-control work in Oregon was carried on, as in the past, as a cooperative project between the Oregon State Board of Horticulture, Oregon State Board of Forestry, Oregon State College and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was made effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1927

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
OREGON STATE BOARD OF HORTICULTURE - - - OREGON STATE BOARD OF  
FORESTRY - - - and the OREGON STATE COLLEGE

Cooperative Work in Controlling White Pine Blister Rust in  
OREGON

\* \* \*

Paragraph E-6 of the Memorandum of Understanding described above contains the following:

"For the Fiscal Year 1928, the Bureau of Plant Industry shall contribute in value approximately \$16,000 to the support of the cooperative work, and the Oregon State Board of Horticulture approximately \$14,250, the Oregon State Board of Forestry approximately \$7,000, and the Oregon Agricultural College shall contribute in value approximately \$1,500; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provision, it is mutually agreed that for the fiscal year ending June 30, 1930 there will be contributed in value by the Oregon State Board of Horticulture approximately \$7,000, by the Oregon State Board of Forestry approximately \$7,000, by the Botany Department of the Oregon State College approximately \$1,000, by the School of Forestry of the Oregon State College approximately \$250, by the Extension Service of the Oregon State College approximately \$500, and by the United States Department of Agriculture, Bureau of Plant



THIS REPORT CONTAINS WORK IN PROGRESS  
1933

Disaster-relief-control work in Oregon was carried on, as in the past, as a cooperative project between the Oregon State Board of Horticulture, Oregon State Board of Forestry, Oregon State College and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1929

between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
OREGON STATE BOARD OF HORTICULTURE - - - - - OREGON STATE BOARD OF FORESTRY - - - - - and the OREGON STATE COLLEGE

Cooperative Work in Controlling White Pine Blister Rust in  
OREGON

\*

Paragraph 2-5 of the Memorandum of Understanding described above contains the following:

"For the Fiscal Year 1928, the Bureau of Plant Industry shall contribute in value approximately \$16,000 to the support of the cooperative work, and the Oregon State Board of Forestry approximately \$14,250, the Oregon State Board of Forestry approximately \$7,000, and the Oregon Agricultural College shall contribute in value approximately \$1,500; hereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provision, it is mutually agreed that for the fiscal year ending June 30, 1930 there will be contributed in value by the Oregon State Board of Forestry approximately \$7,000, by the Oregon State Board of Forestry approximately \$7,000, by the Oregon State College approximately \$1,500, by the School of Forestry of the Oregon State College approximately \$250, by the Extension Service of the Oregon State College approximately \$500, and by the United States Department of Agriculture, Bureau of Plant



Industry, through its Office of Blister Rust Control, approximately \$9,500 in connection with cooperative blister rust control work in Oregon.

Date:

Signature:

(s) T. A. Sammis Jr.  
President, Oregon State Board of Horticulture

(s) F. A. Elliott  
State Forester, Oregon State Board of Forestry

(s) H. F. Barss  
Plant Pathologist, Oregon State College

(s) Geo. W. Peavy  
Dean, School of Forestry

(s) Paul V. Maris  
Director of Extension Service

12/13/29

(s) Wm. A. Taylor  
Chief, Bureau of Plant Industry



Industry, through its Office of Blister Plant Control, approximately \$9,500 in connection with cooperative blister plant control work in Oregon.

Date:

Witnesses:

(s) T. A. Salmons Jr.  
President, Oregon State Board of Horticulture

(s) T. A. Willott  
State Forester, Oregon State Board of Forestry

(s) H. L. Parson  
Plant Pathologist, Oregon State College

(s) Geo. W. Parry  
Dean, School of Forestry

(s) Paul V. Harris  
Director of Extension Service

(s) Wm. A. Taylor  
Chief, Bureau of Plant Industry

12/13/29



# BLISTER RUST CONTROL WORK IN OREGON, 1929

By

L. N. Goodding,  
Associate Pathologist.

## THE WIND RIVER NURSERY

It was thought best to do re-eradication work at the Wind River Nursery as no adequate recheck had been made of the work done in 1928 and it was considered to be certain that some Ribes bracteosum had been missed and that some had sprouted from crowns and fallen stems. With this in mind, Mr. Lyle and Mr. Binckley were assigned to the work with instructions to go over carefully as much of the stream type as possible before July 1, 1929, paying special attention to sections which had yielded much R. bracteosum in 1928. They were on the ground from June 16 to 28.

The recheck showed less misses and sprouting than were to be expected in stream type of the character worked. All our experience with R. bracteosum has taught us that crowns and layers hold tenaciously to life. In an ordinary situation where general protection is what is desired, further work should be unnecessary for several years.

The figures in the table do not show the true situation unless it is remembered that the major portion of the recheck was confined to the areas where Ribes were found to be abundant last year.

TABLE NO. 1.

### RESULTS OF RE-ERADICATION - WIND RIVER NURSERY, 1929.

Species	1928			1929		
	No. Bushes	Feet Live Stem	No. Bushes	Feet Live Stem	Per Cent of 1928	
					Bushes	Feet Live Stem
<u>R. bracteosum</u>	6,058	40,778	345	8,747	5.8	1.1

To base the comparison on an acreage basis is obviously erroneous as an attempt was made to cover the entire area by scouts or crew in 1928, whereas very little attention was paid to anything but stream type in 1929. While the per cent of bushes eradicated in 1929 to those eradicated in 1928 is rather high, the per cent of live stem is low. The reason for this is obvious.







An analysis of the results of the recheck shows that of the total bushes eradicated 73 were seedlings, 146 others were six inches or less in height, another 102 were one foot or less in height and 33 were over 1.5 feet in height, 13 very evidently came from old crowns or fallen stems which had sprouted.

Seedlings are bound to be a continued source of annoyance as the fruit will be constantly supplied from higher levels by natural work.

No adequate work was done on a recheck of R. sanguineum. Only one bush was encountered within the 1,500-ft. zone, but it was a fair sized bush. Next year there are bound to be a good many seedlings in evidence on land where road building and snag falling has disturbed the soil. The land for the most part, however, is rapidly growing up to brush which will suppress much of the Ribes growth in the future.

#### Recommendations

Lyle's recommendation follows: "I suggest that a recheck for R. sanguineum be made within the 1,500-ft. radius by two men during flowering season, allowing about three days for the work, and that a crew of four men who have had previous experience in eradication take about six days to recheck the stream type again during the early summer of 1931, preferably, or of 1930. This should complete the eradication for a considerable period of time. There will, however, always be a fairly rapid reseeding from plants on streams above and outside the eradication zone. In using a crew of four men to recheck, it would be desirable for them all to work together on the area along Martha Creek as far as the water inlet for the nursery and along Trout Creek (especially above the bridge where the stream type widens out over a considerable area), and then to form two two-men crews in working the side streams to Martha and Trout Creeks."

Before further work on the nursery is done I think we should have the attitude of the Plant Quarantine and Administration Board in regard to shipping seedling pines planted after the nursery was placed in a sanitary condition. The Arboretum in itself does not seem to me to warrant the expenditure of the money necessary to protect it alone. If, however, the nursery can supply what is likely to be a growing demand for white-pine seedlings, the very moderate expense is justifiable.

If the R. bracteosum could be cleared out to the head of the streams on the Martha Creek side, the maintenance cost would be much less. Such a program on the Trout Creek side is out of the question as the tributaries are too distant and cover too much territory.



[illegible]

as the fruit will be considerably enlarged and will have a new taste of sweetness.

... ..

Земельный кодекс

[illegible][illegible]

If the A. A. Protection could be obtained out of the hands of the streets on the West Greek side, the maintenance of the world of men. Such a picture on the front Greek side is one of the most interesting. The pictures are too small and cover too much territory.



[illegible]

A vertical scale bar with markings for 1/4 mil, 1/2 mil, and 3/4 mil.

B7 LN.GOODING.

Dec. 14, 1929

WIND RIVER EXPERIMENT STATION AREA







## NURSERY SANITATION

### Peavy Arboretum

By request of Dean Geo. W. Peavy of the School of Forestry of the Oregon State College, the Office of Blister-Rust Control undertook to put the Peavy Arboretum and Nursery in a sanitary condition so that white and sugar pines might be grown for possible distribution and for arboretum purposes. The nursery itself is small. At the time *Ribes* eradication work was started there were about five acres under cultivation. Only about half of this was in nursery stock, and no five-needled pines had been planted. In the Arboretum, however, western white pines had been planted in several places.

A preliminary survey of the grounds was made by McDaniel, nurseryman at the Peavy Arboretum, and L. N. Goodding, while *R. sanguineum*, the major species on the grounds, was in blossom. The streams were carefully scouted but no *R. bracteosum* was found. There was revealed, however, considerable *R. lacustre* and *R. divaricatum*. It was thought best to do a part of the eradication work while *R. sanguineum* was in blossom and for that reason a crew of students was put on the ground May 4 and an excellent showing was made. Further attempt to do work before school closed was a failure owing to the press of class work at that time.

No attempt has been made to classify the land into different types. The streams were worked in conjunction with the rest of the land. Practically all the area covered can be classed as open brush type, though a small part is timbered. The timbered portion is about as brushy as the more open land. All of the land east of the highway is an open field and the only work required was a cruise of the stream.

While the situation seemed to present no difficulties, one of great importance was encountered. Poison ivy is so abundant that in spite of all precautions all those who worked for two or more days were attacked and in two cases the poisoning was severe.

A glance at the map will reveal the location of the arboretum, the nursery and the areas eradicated.



# DISCUSSION

## General Observations

By request of the Board of Education of the District of Columbia, the Office of Biological Services took to the field to study the various species of plants and animals which are found in the District of Columbia and for which the Office of Biological Services is responsible. The purpose of this study is to determine the distribution and abundance of these species in the District of Columbia and to determine the factors which influence their distribution and abundance. Only about half of the plants and animals which are found in the District of Columbia have been studied to date. In the future, it is hoped that the Office of Biological Services will be able to study the remaining half of the plants and animals which are found in the District of Columbia.

A preliminary survey of the plants and animals of the District of Columbia was made by the Office of Biological Services in the summer of 1934. This survey was made by the Office of Biological Services in the summer of 1934. The purpose of this survey was to determine the distribution and abundance of the plants and animals of the District of Columbia. The results of this survey are given in the following table. The table shows the distribution and abundance of the plants and animals of the District of Columbia. The table is divided into two parts. The first part shows the distribution and abundance of the plants of the District of Columbia. The second part shows the distribution and abundance of the animals of the District of Columbia. The table is divided into two parts. The first part shows the distribution and abundance of the plants of the District of Columbia. The second part shows the distribution and abundance of the animals of the District of Columbia.

No attempt was made to determine the distribution and abundance of the plants and animals of the District of Columbia in the summer of 1935. The purpose of this survey was to determine the distribution and abundance of the plants and animals of the District of Columbia. The results of this survey are given in the following table. The table shows the distribution and abundance of the plants and animals of the District of Columbia. The table is divided into two parts. The first part shows the distribution and abundance of the plants of the District of Columbia. The second part shows the distribution and abundance of the animals of the District of Columbia.

While the situation seemed to present no difficulties, the Office of Biological Services was concerned. The purpose of this survey was to determine the distribution and abundance of the plants and animals of the District of Columbia. The results of this survey are given in the following table. The table shows the distribution and abundance of the plants and animals of the District of Columbia. The table is divided into two parts. The first part shows the distribution and abundance of the plants of the District of Columbia. The second part shows the distribution and abundance of the animals of the District of Columbia.

A plan of the work will be submitted to the Board of Education of the District of Columbia. The purpose of this survey was to determine the distribution and abundance of the plants and animals of the District of Columbia. The results of this survey are given in the following table. The table shows the distribution and abundance of the plants and animals of the District of Columbia. The table is divided into two parts. The first part shows the distribution and abundance of the plants of the District of Columbia. The second part shows the distribution and abundance of the animals of the District of Columbia.



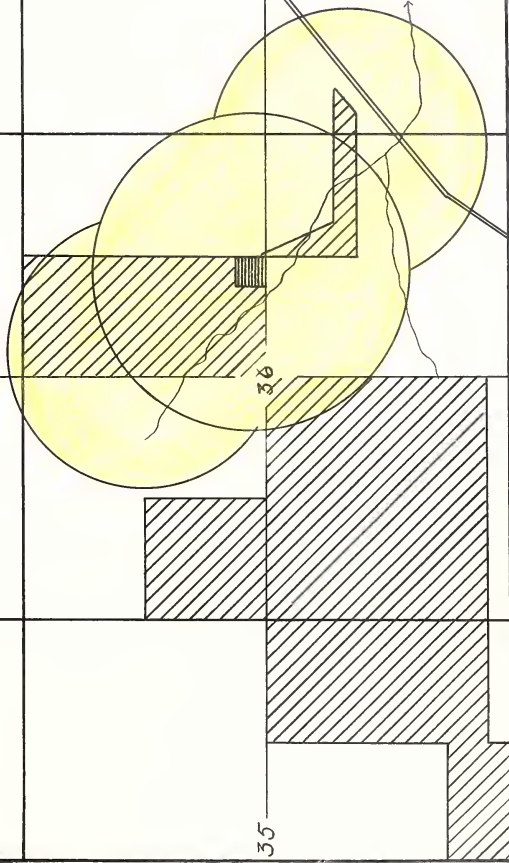
R 5 W

R 4 W

Circles indicate areas from which Ribs have been eradicated.

T10S 35

31 T10S

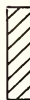


WILLAMETTE MERIDIAN

ONE MILE SCALE

# PEAVY ARBORETUM AND NURSERY

BENTON COUNTY, OREGON



ARBORETUM



NURSERY

L.N. GOODING - Dec. 15, 1929







TABLE NO. 2.

## PEAVY ARBORETUM AND NURSERY

Ribes Eradicated		
Species	No. Bushes	Feet Live Stem
<i>R. sanguineum</i>	1,362	42,943
<i>R. lacustre</i>	65	620
<i>R. divaricatum</i>	234	9,117
Totals	1,661	52,680

Acres covered . . . . . 396

Ribes per acre. . . . .	4.2
-------------------------	-----

Live stem per acre. . . . . 136 ft.

Labor . . . . .	37	man days
-----------------	----	----------

Acres per man day . . . . . 10.7

Bushes per man per day. . . . .	45
---------------------------------	----

Live stem per man per day . . . . . 1.532 ft.



# TABLE No. 3.

## FRUIT PRODUCTION AND LABOR

Limes marketed		
Year	No. of trees	Species
1908	1,200	R. sanctum
1909	80	R. f. latifolia
1910	200	R. diversifolia
1911	1,000	Total

Acres covered . . . . .  
 Limes per acre . . . . .  
 Live stock per acre . . . . .  
 Labor . . . . .  
 Acres per man day . . . . .  
 Limes per man day . . . . .  
 Live stock per man day . . . . .



### Work Needed in the Future

It is planned to go over the ground next spring when the R. sanguineum is in blossom. This will be done by students of the School of Forestry under direction of the Blister-Rust Office.

### ERADICATION IN THE STILL CREEK AREA, 1929

The Ribes eradication work was resumed in the Still Creek area June 28. Most of the work had been completed north of the main stream, but an area of considerable extent remained south of it. This represented some difficult territory with stream type of a swampy nature with an abundance of Ribes. Most of the work was hand eradication, the chemical work being on an experimental basis. A small area consisting mostly of R. lacustre, with some R. bracteosum, was chemically eradicated at the close of the season.

The total acreage for the season was 460, of which 37.6 acres were stream type and the remainder open-reproduction type. Of the 37.6 acres of stream type, 5.6 acres were chemically eradicated. As the stream type, except for that chemically eradicated, was worked in conjunction with the open-reproduction type no comparative study of costs on the two types can readily be made.

The chemical eradication was a very expensive piece of work. The Ribes per acre will indicate that they were heavily concentrated. The plot was well up on the side of a mountain and chemicals had to be carried long distances, mostly by back-packing.

Computing the man-days by a comparison of the Ribes in stream and open-reproduction types we find that approximately 77 man-days were expended on the open-reproduction type. 422 acres were covered, or 5.5 acres per man-day. 198 man-days were expended on the stream type, exclusive of the portion chemically eradicated, or .19 acres per man-day. 35 man-days were used on the chemical eradication, or .16 acres per man-day.



work needed in the future

It is planned to go over the ground next spring when the *E. sanguineum* is in blossom. This will be done in attendance of the School of Forestry under direction of the University of Illinois.

#### REPRODUCTION IN THE FIELD UNDER FIELD, 1922

The Ribes eradication work was resumed in the fall of 1922. Most of the work had been completed south of the main stream, but an area of considerable extent remained south of it. This represented some difficult territory with stream type of stream nature with an abundance of Ribes. Most of the work was done in the fall, the chemical work being on an experimental basis. A small area consisting mostly of *E. laetevirens*, with some *E. laetevirens*, was chemically eradicated at the close of the season.

The total number for the season was 401, of which 37.1 acres were stream type and the remainder open-reproduction type. Of the 37.1 acres of stream type, 5.6 acres were chemically eradicated. As the stream type, except for that chemically eradicated, was worked in conjunction with the open-reproduction type no comparative study of costs on the two types can readily be made.

The chemical eradication was a very expensive piece of work. The Ribes per acre will indicate that they were heavily concentrated. The plot was well up on the side of a mountain and considerable work was carried long distances, mostly by back-packing.

Comparing the man-days by a comparison of the Ribes stream and open-reproduction types we find that approximately 17 man-days were expended on the open-reproduction type. 40.1 acres were covered, or 2.5 acres per man-day. 198 man-days were expended on the stream type, exclusive of the portion chemically eradicated, or 1.9 acres per man-day. 12 man-days were used on the chemical eradication, or 1.6 acres per man-day.



TABLE NO. 3.

NUMBER BUSHES AND FEET LIVE STEM PER ACRE, STILL CREEK, 1929.

## Hand Eradication

Type	Acres	R. lac.		R. sang.		R. brac.		R. visco.		Total	
		Bushes	Feet I.S.	Bushes	Feet I.S.	Bushes	Feet I.S.	Bushes	Feet I.S.	Bushes	Feet I.S.
Open reproduction	422.4			2.6	191.8			1.9	98.1	4.5	289.9
Stream	32.0	119.0	4,083			13.6	595			132.6	4,678.0
Total	454.4	119.0	4,083	2.6	191.8	13.6	595	1.9	98.1	137.1	4,967.9
Chemical Eradication											
Stream	5.6	260.0	29,946			38.6	4,010			298.6	33,956
Total	5.6	260.0	29,946			38.6	4,010			298.6	33,956

## Total: All Species

Type	Acres	Bushes	Ft. I.S.
Open reproduction	422.4	4.5	289.9
Stream	37.6	431.2	38,634.0
Totals	460.0	435.7	38,923.9







TABLE NO. 4.

ACTUAL FIELD COST OF STILL CREEK ERADICATION.

I t e m		C o s t
Salaries	Temporary men	\$1,306.06
	Salary of cook	280.00
Subsistence	Cost of food	379.65
	Transp. of food	15.00
Transportation of men		42.00
Total		\$2,022.71

Average cost per acre..... \$4.40

Cost per acre, open reproduction type \$1.19

Cost per acre, stream type hand eradication \$34.20

Cost per acre, stream type chemical eradication..... \$41.81

Cost of eradication per acre based on number of man-days labor, expense at camp, including transportation to and from camp, and meal expense. This was derived from the above cost account, an account to include only the expenses for men actually working in camp. There was practically no new equipment purchased for the fiscal year 1929.



ACTUAL FIELD COST OF RIVER CREEK RECONSTRUCTION

I t e m		C o s t
Salaries	Temporary men	\$1,800.00
Subsistence	2 days of cook	70.00
	Cost of food	218.50
Transportation of men	Travel of food	18.00
		40.00
Total		\$2,036.50

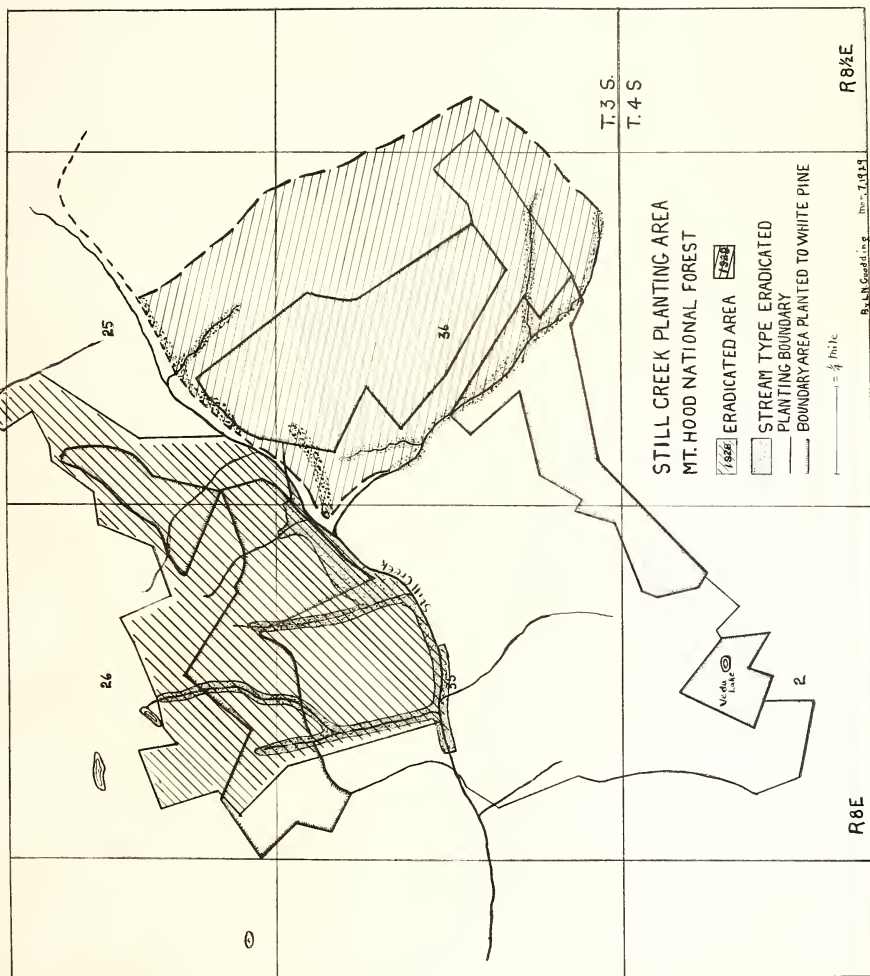
Average cost per acre..... \$4.43  
 Cost per acre, open reconstruction type..... \$1.12  
 Cost per acre, stream type hard reconstruction..... \$4.12  
 Cost per acre, stream type mechanical reconstruction..... \$4.12

Cost of excavation per acre based on number of man-days labor, expense at camp, including transportation to and from camp, and meal expense. This was derived from the above cost account, and includes only the expenses for men actually working in camp. There was practically no new equipment purchased in the fiscal year 1934.



RIBES ERADICATION

OREGON









## Recommendations

No adequate checking on the work on the Still Creek planting has been done. The streams will certainly need to be worked carefully, as much R. bracteosum and R. lacustre have, without doubt, sprouted from fragments of crowns and fallen stems. There are also abundant seedlings in places but most of these are still too small to be readily detected. It is a question whether the planted area near Veda Lake should be worked. The Ribes are very concentrated and the area of pines is hardly extensive enough to pay for the work. A portion of the area, however, has been eradicated in connection with the chemical eradication experiments.

Down stream from the area eradicated during the summer of 1929, on the south side of Still Creek, is a small area varying from a rod to several rods in width and perhaps 15 chains long which should be eradicated if possible next summer to round out the Still Creek job and insure a fair degree of protection to pines.

By reference to the map on page 218 of the 1928 report it will be seen that an area of white pine of considerable extent occurs south of Still Creek, well up on the slope. Much of this represents land that can be worked by scouts, but there are several places where swamps with abundant R. lacustre occur. This should be worked to round out the eradication job.

In order to make the chemical eradication performed in 1929 effective, it would seem best to go over the areas as early in the season as possible and respray where sprouting has occurred.

## EDUCATIONAL AND OFFICE WORK

As part of the normal duties of the state leader in Oregon, a considerable amount of work is done at the Corvallis office in receiving and sending out communications and circularizing the personnel of various cooperating organizations. Numerous requests for information regarding white-pine blister rust, the methods for its control and the status of the work in Oregon are received and answered. During 1929, 315 communications were received at the Corvallis office and 283 original letters were sent out. Two circular letters were also prepared and mimeographed and sent to Forest Service officials and state fire wardens. These two form letters, 647 of which were sent out, are shown on the two following pages.

As a secondary activity of the state leader, a trip was made on August 22 to Gunter, Oregon in company with Mr. J. O. Holt of the







Eugene Fruit Growers' Association, to investigate the reported occurrence of chestnut blight at that place. This work was done at the request of Doctor Haven Metcalf of the Office of Forest Pathology. Several chestnut trees were found at this place which were infected with the chestnut blight. A careful examination of the native chinquapin in the vicinity of Gunter failed to reveal the presence of the disease upon these shrubs.

SAMPLE

UNITED STATES DEPARTMENT OF AGRICULTURE  
Bureau of Plant Industry  
In Cooperation with  
THE OREGON STATE BOARD OF FORESTRY

Office of Blister Rust Control  
Oregon State College  
Corvallis, Oregon  
February, 1929

Blister-Rust Control

Dear Sir:

I am sending you a list of the places where blister rust was found in Oregon last fall. You will notice by this that it made a sweeping advance during 1928. I wish to call your attention to a few points which seem to me to be significant.

First, blister rust is firmly established on white pines in Oregon in a region where its extermination is impossible.

Second, blister rust is established in several places where its intensification will result in a rapid advance of the disease toward the sugar pines of southern Oregon and California.

Third, while no rust has been found on pines in the Wilson River region west of Gales Creek, the intensification of the rust on currants in that and adjoining sections indicate that there are diseased pines in that territory which were scattering spores during 1928.

Fourth, the rust was found east of the Cascades, and on both the east and west slopes it is dangerously near the sugar pine limits. Sugar pine, as you doubtless know, extends to the Breitenbush on the west slope, and to White Water Creek north of the Metolius east of the mountains.

Fifth, the rust is usually far ahead of the limits we are able to discover. If this is the case in Oregon, sugar pine will soon show the effects of blister rust attack within its native territory.

Blister rust is with us, with us to stay, and with us to do an enormous amount of damage within a very few years. There are many



victim of Gutter failed to reveal the residence of the witness upon  
 chestnut Street. A careful examination of the native claim, made in the  
 chestnut trees were found at this place which were infected with the  
 Doctor Haven Metcalf of the Office of Forest Pathology. Several  
 of chestnut blight at that place. This was found to be the most  
 aggressive fruit growers' association to investigate the negative country  
 these groups.

1922

UNITED STATES DEPARTMENT OF JUSTICE  
 FEDERAL BUREAU OF INVESTIGATION  
 WASHINGTON, D. C. 20535

1070-000 John Marshall Jr. 001100  
 1070-000 John Marshall Jr. 001100  
 1070-000 John Marshall Jr. 001100  
 1070-000 John Marshall Jr. 001100

Bilster-Rust Control

1710 108C

[illegible]

the information will remain confidential and will be given to someone higher up in the hierarchy of the Government of Ontario.

...the fact that the ...

Fourth, the trail was found east of the creek, and on both the east and west sides it is dangerously near the upper alluvial. Stream beds, as you doubtless know, extend to the tributaries of the west slope, and to White Creek north of the westernmost of the mountains.

to discover if this is the case in Oregon, where one will soon have the effects of blizzards without the accompanying temperatures.

an enormous amount of damage. It is a very few years. There are many



places in the Cascades where we can ill afford to lose our western white pines and certainly we cannot afford to lose our sugar pine.

Please watch for outbreaks of the disease next spring and study the blister rust situation. After we know where the rust is, something about the timber at stake, and something about our chances of saving it, perhaps there is something we can do.

Thanking you for your watchful eye, I am

Yours very truly,

(s) Leslie N. Goodding,  
Associate Pathologist.

SAMPLE

UNITED STATES DEPARTMENT OF AGRICULTURE  
Bureau of Plant Industry  
In Cooperation With  
THE STATE BOARD OF FORESTRY

Blister-Rust Control

Office of Blister Rust Control  
Botany Department, O.S.C.,  
Corvallis, Oregon.  
September 10, 1929.

The time is ripe to look for white pine blister rust. As the rains start and your work with fires begins to ease up, you may find time to examine currants or gooseberries in your immediate neighborhood for blister rust. This is the season when it is easiest to find. In case you see something you believe to be the rust, collect a specimen and send it to me, giving the locality, date collected and your name. Also, you may ask any questions you wish. If I cannot answer them, perhaps some one else at the college can.

Blister rust has been found on pines on a small creek near Palmer on Herman Creek, on Sandy River, on Zigzag River, on Camp Creek, on Still Creek and on Salmon River; all in the Mt. Hood National Forest. It is unquestionably present on pines in the Wilson River region in Tillamook County, though infection has not yet been located there. It is not unlikely that it is also established on pines in the Black Rock region in Polk County.

When you find infection on currants, note whether white pines are in the immediate vicinity, and include the notation in your letter



places in the Cascades where we can all expect to find our western white  
lines and certainly we cannot afford to lose any more.

Please watch for outbreaks of the disease next spring and  
study the blaster rust situation. After we know where the rust is, some-  
thing about the timber at stake, and something about our chances of  
saving it, perhaps there is something we can do.

Thanking you for your watchful eye, I am

Yours very truly,

(s) Leslie A. Goodrich  
Associate Entomologist

32015

UNITED STATES DEPARTMENT OF AGRICULTURE  
Bureau of Plant Industry  
In Cooperation with  
THE STATE BOARD OF FORESTRY

Office of Forest Pest Control  
Forest Department, U.S.D.A.,  
Corvallis, Oregon  
September 10, 1921.

Blister-Rust Control

The time is ripe to look for white pine blister rust. As  
the rains start and your work with fires begins to ease up, you will  
find time to examine conifers or gooseberries in your immediate vicinity  
look for blister rust. This is the season when it is easiest to  
In case you see something you believe to be the rust, collect a  
specimen and send it to me, giving the locality, date collected and  
your name. Also, you may ask any questions you wish. If I cannot answer  
them, perhaps some one else at the college can.

Blister rust has been found on pines on a small creek near  
Elmer on Herman Creek, on Sandy River, on Rigby River, on Long Creek,  
on Still Creek and on Salmon River; all in the Mt. Hood National Forest.  
It is unquestionably present on pines in the Elmer River region in  
Williamson County, though infection has not yet been located there.  
It is not unlikely that it is also established on pines in the Elmer  
River region in Polk County.

When you find infection on conifers, note whether white pines  
are in the immediate vicinity, and include this information in your letter.



to me. It is very important that we know where the rust is this fall. Remember it travels long distances from diseased pines to currants and gooseberries. The wild stink currant west of the Cascades is the best plant to examine for it. Wild Coast black gooseberry is also a good host. East of the mountains, the wild black currant is most likely to take the disease.

Many thanks for your help.

Yours very truly,

(s) Leslie N. Goodding,  
Associate Pathologist.



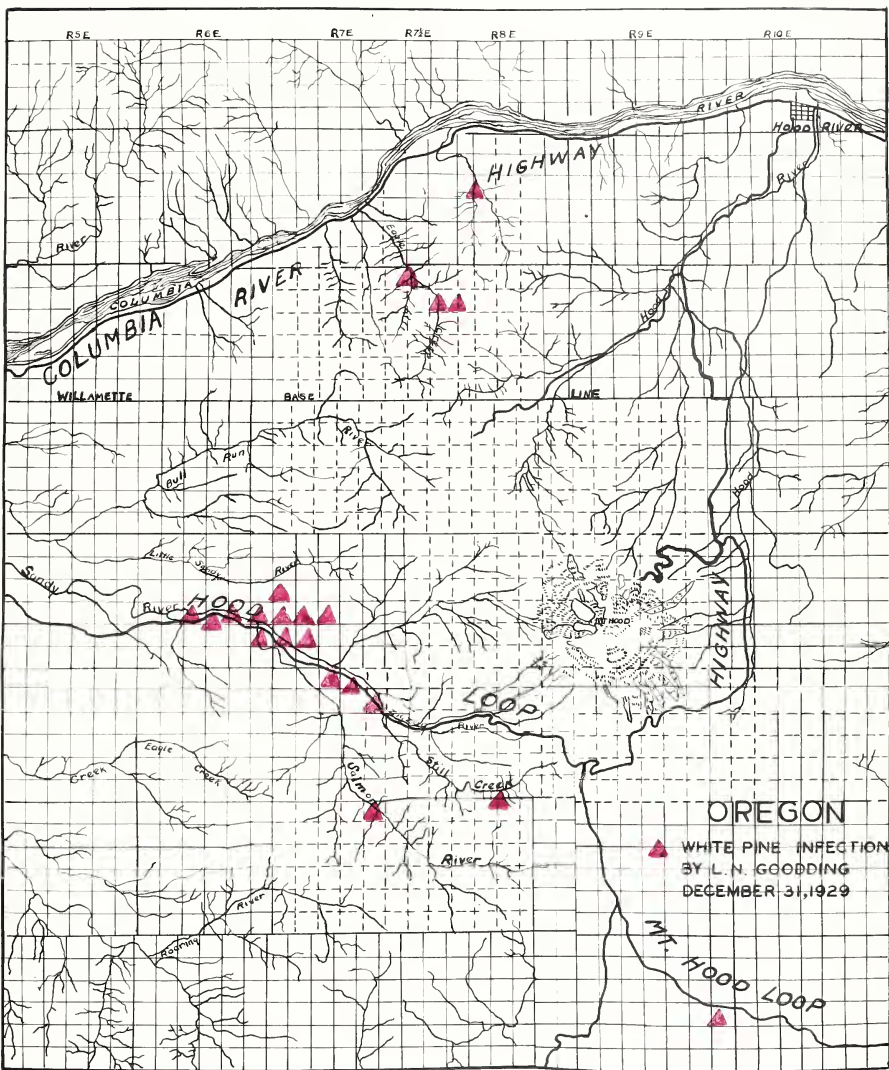
to me. It is very important that we know where the trail is. Remember it travels long distances from disease to disease and goes everywhere. The wild stick current west of the Cascades is the best place to examine for it. Wild Coast black gooseberry is a good host. East of the mountains, the wild black current is most likely to take the disease.

Many thanks for your letter.

Yours very truly,

(2) Leslie E. Goodenough,  
Associate Entomologist.

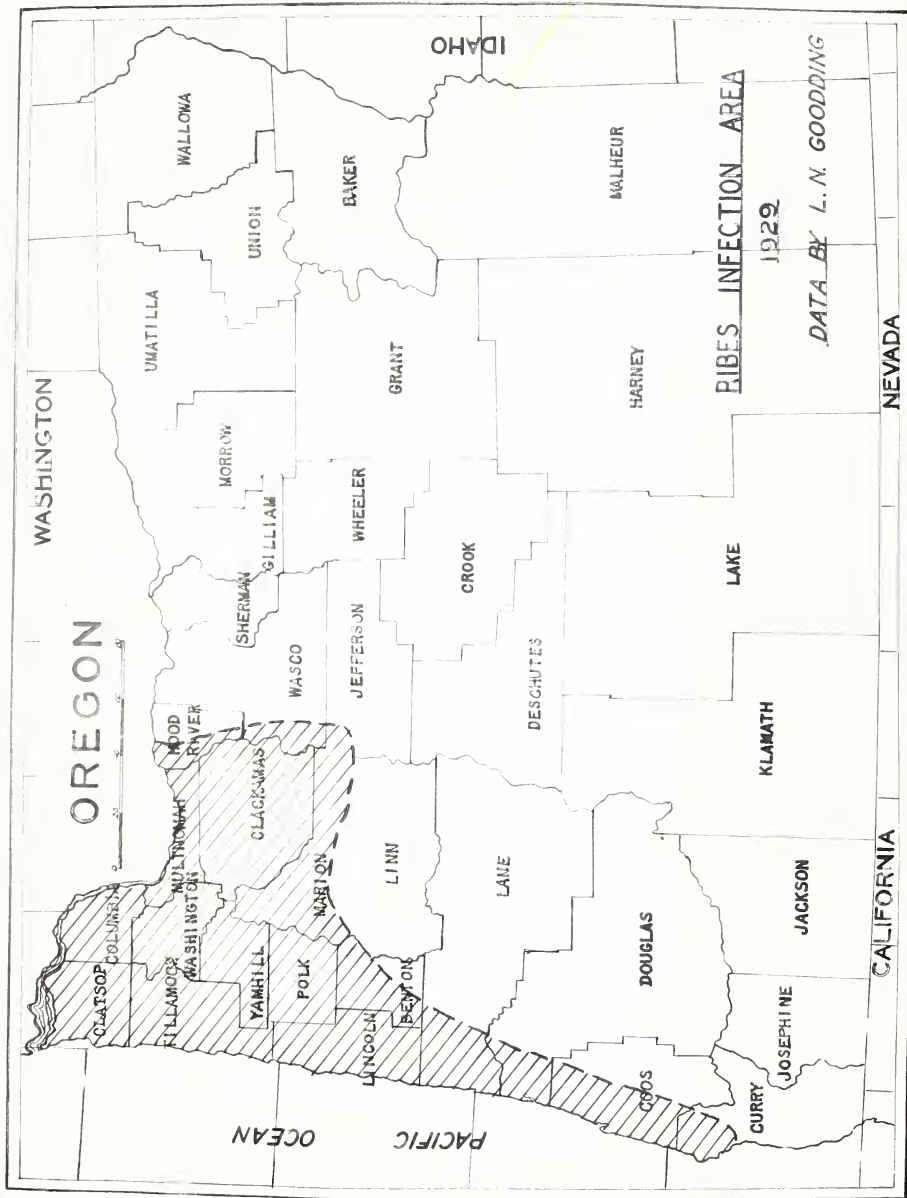


















## SCOUTING TO DETERMINE BLISTER RUST SPREAD

Scouting for pine infection was started in the Mt. Hood region as soon as weather conditions permitted. The first infected trees were found on Herman Creek at a point near the Ribes infection point of last year. In this area there are but few white pines and many of these are remote from the stream. Near the stream, five infected trees were found; the most heavily diseased bore 57 cankers. An analysis of these showed 48 incipient cankers none of which had produced pycnia, 2 which had produced pycnia, 5 which had produced aecia once and 2 which had produced aecia twice. Five infections had entered 1923 wood, 3-1924 wood, 25-1925 wood, 22-1926 wood and 2-1927 wood. Infection apparently took place in 1925 and a very heavy intensification took place in 1927. A nearby tree about 25 feet in height had but one canker. This was apparently on 1923 wood, but had fruited two or possibly three times. As the canker was a large, old one, the infection may have entered on 1921 or 1922 wood and have been due to a 1923 infection.

Lyle found infection on Eagle Creek. Later this area was studied by Putnam and Goodding and data on it are included in the former's report. A much more careful study will need to be made to account for the ubiquitous nature of the infection. Infection seems to be general a considerable distance from the stream, and R. sanguineum seems to be infrequent.

Lyle also found a single canker at the head of Beaver Creek. Ribes at this point are scarce and the infection appears to have been a chance catch. It is interesting in that it indicates that infection is likely to be established at several places east of the mountains where there are favorable associations of pines with R. petiolare.

Riley and Goodding spent much time scouting the headwaters of Salmon River and the Santiam River, but no pine infections were located and no Ribes infections in excellent association with pines.

One pine infection was found within the Still Creek planting, but not in the portion planted to white pine.

A special study of pine infections in the Rhododendron region was made by Putnam and his crew. Here the disease is wide-spread on the pines and in several places pines are already dying. At one point about two miles above Rhododendron, on Camp Creek, one tree has several hundred cankers.

Blister rust was found on Ribes over a greatly extended territory in spite of the fact that the dryness of the season was unfavorable for the spread and intensification of the disease. Northern Clatsop



SCOTTING TO WOODS IN THE WESTERN

Scouting for nine infections was started in the fall of 1933. As soon as weather conditions permitted. The first infection found on Herman Creek at a point near the mouth of the stream. In this area there are but few high trees and the stream is remote from the stream. Near the stream, five infections were found; the most heavily diseased bore 51 cankers. In nearby woods showed 48 incipient cankers none of which had produced lesions. A nearby tree bore 3 which had produced lesions once and 3 which had produced lesions twice. Five infections had survived in 1934. 23-1933 wood, 23-1933 wood and 2-1934 wood. Infection was found in 1933 and a very heavy infection in 1934. A nearly tree bore 23 wood, but had killed two or possibly three times. As the canker was a large, old one, the infection was a very old one. 1931 or 1932 wood had been found in 1933 infection.

The found infection on Herman Creek. Later this infection was studied by Primm and Gooding. The first of it was found in 1934. A more careful study will now be made to account for the distribution of the infection. Infection seems to be general a considerable distance from the stream, and it seems to be independent.

Life also found a single canker at the mouth of Herman Creek at this point and the infection appears to have been chance catch. It is interesting to find it in this point is likely to be established at several places east of the mouth. Where there are favorable associations of trees with 23 infections.

Riley and Gooding spent much time scouting in the vicinity of Herman River and the Salmon River, but no infections were located and no trees infections in association with 23.

One pine infection was found within 100 feet of the stream, but not in the portion planted to white pine.

A special study of nine infections in the photograph region was made by Primm and his crew. These infections were found on the lines and in several places. These are already 1934. It was found about two miles above Rhododendron, on the creek, and two miles above Rhododendron.

Dispersal was found on lines over a greater distance. It is in spite of the fact that the spread of the infection was unfavorable for the spread and intensification of the disease. North in 1934.



County and the coast region, where infection was found in 1925 and in 1927 and 1928, seemed to be free of the rust. This could be accounted for in part from the meager amount of scouting, but not entirely so. Several very favorable places were scouted without finding a trace of the disease. In strange contrast with this was the infection in the Cochran region where R. bracteosum for miles along several streams was generally and heavily infected. Pines in the Cochran region are very scattered and no good associations were found; but no one seeing the extent and heaviness of infection can doubt that diseased pines are nearby.

No infection was found on the lower Wilson River, but it is prevalent near the headwaters of the stream where pines are common. Here again, infection on pines was not located--probably owing to our inability to find good associations of Ribes and pines.

Of outstanding importance was the location of infection by Root and Harris below Port Orford in Curry County, and that by Partington and Mielke on the Metolius. Considerable scouting by Root, Harris, Benedict and Riley failed to reveal infection along the coast north of Brush Creek. The location made by Partington and Mielke represents a big advance of the rust east of the mountains, and the first point where a good association of Ribes and sugar pines occurs.

The infection on Devils Creek, about a mile above Breitenbush Hot Springs, represents the farthest point south on the west side of the Cascades at which infection has been found.

Meager scouting in the Falls City and Marys Peak region revealed the rust on Ribes to be more generally spread than in 1928.

A glance at the chart tabulations will show that infection has been found on four species of Ribes in Oregon in 1929, viz.: R. bracteosum, R. sanguineum, R. triste and R. divaricatum. To this list should be added R. lacustre on which abundant infection was found in the Rhododendron region.



County and the coast region, where infection was found in 1935 and 1937 and 1938, seemed to be free of the virus. This could be accounted for in part from the meager amount of association, but not entirely so. Several very favorable places were located without finding a trace of the disease. In extreme contrast with this was the infection in the Cochran region where A. praeceus for miles along several streams was generally and heavily infected. Pines in the Cochran region are very scattered and no good associations were found; but no one could the extent and heaviness of infection can doubt that the disease is are nearby.

No infection was found on the lower Wilson River, but it is prevalent near the headwaters of the stream where pines are common. Here again, infection on pines was not located--probably owing to our inability to find good associations of Ribes and pines.

Of outstanding importance was the location of infection at Root and Harris below Fort Collins in Inyo County, and near by Huntington and Mielke on the Mojave. Considerable amount of work, Harris, Benedict and Wiley failed to reveal infection along the coast north of Brush Creek. The location made by Huntington and Mielke represents a big advance of the west coast of the mountains, and the first point where a good association of Ribes and sugar pines occurs.

The infection on Nevils Creek, about a mile above the mouth of Hot Springs, represents the farthest point south on the west side of the Coast Range at which infection has been found.

Weger scouting in the Tallah City and Lakeview region revealed the fact on Ribes to be more generally spread than in 1935.

A glance at the chart tabulations will show that infection has been found on four species of Ribes in Oregon in 1935, viz.: R. praeceus, R. sanguineum, R. viscidifolium, and R. divaricatum. To this list should be added R. lacustris on which abundant infection was found in the Klamath region.



TABLE NO. 5.  
RECORD OF BLISTER RUST INFECTIONS FOUND ON PINES IN REGION, 1929

County	Region	T. P.	S.	Host	Number		Inspector	Date	Remarks
					Examined	Infected			
Clackamas	Salmon River.	4S 7E 2	P. multicaule	"	10	1	Elzey	8-6-29	A single heavily infected.
	Still Creek.	4S 8E 2	"	"	10	1	Elzey	7-14-29	At Still Creek plant.
Wood River	Herman Creek.	2N 8E 1E	"	"	15	5	Gooding	8-29-29	"
							Elzey	8-10-29	"
	Teale Creek.	1N SE 6S 2	"	"	50	10	Putnam and Gooding	10-15-29	"
Tesco	Reaper Creek.	5S 10E 1E	"	"	"	1	Elzey	8-14-29	A single heavily infected.

TABLE NO. 6.  
RECORD OF BLISTER RUST INFECTIONS FOUND ON PINES IN REGION, 1929

County	Region	T. P. S.	Host	Number		Per Cent	Per Cent	Per Cent	Association	Inspector	Date
				Examined	Infected	Infected	Uredinia	Telia	Neotoma		
Benton	Verity Peak.	12S 7W 2E	R. bracteatum	50	10	50	0	100	0	Very poor.	Size
Clackamas	Still Creek.	4S 7E 1E	"	"	"	"	"	"	"	Gooding and Elzey	7-10-29
	Salmon River.	4S 7E 1E	"	2	2	100	0	0	0	Excellent.	Gooding and Barker
	Reaping River.	5S 6E 0	"	100	1	10	0	100	0	Good.	Gooding and Elzey
	Fish Creek.	5S 3E 1	"	250	1	1	0	100	0	Very poor.	Elzey
	Fish Creek.	5S 3E 2	"	200	1	1	0	100	0	Very poor.	Elzey
	Fish Creek.	5S 5E 1E	"	100	1	1	0	100	0	Very poor.	Elzey
	Clackamas River.	5S 6E 2E	"	100	1	10	0	100	0	Very poor.	Elzey
	Clackamas River.	5S 6E 2E	R. sempervirens	25	1	50	0	100	0	Very poor.	Gooding and Elzey
	Clackamas River.	5S 6E 2E	R. bracteatum	25	5	20	0	100	0	Very poor.	Gooding and Elzey
	Purple Mt.	3S 5E 3E	R. bracteatum	50	10	10	0	100	0	Excellent.	Clackamas
	Still Creek.	3S 5E 3E	R. bracteatum	1	1	100	0	100	0	Excellent.	Size
	Teale Lake.	4S 6E 2E	R. bracteatum	50	2	10	0	100	0	Excellent.	Size
	Teale Ridge.	4S 5E 3E	"	200	5	10	0	75	25	Excellent.	Clackamas
	Teale Lake.	4S 5E 3E	"	200	5	10	0	100	0	Excellent.	Clackamas
	Teale Lake Dam.	4S 5E 3E	"	200	5	10	0	100	0	Very good.	Clackamas
	Camp Creek.	3S 7E 1E	R. bracteatum	50	10	50	0	50	50	Excellent.	Gooding and Elzey
	Camp Creek.	3S 7E 1E	R. bracteatum	50	10	50	0	50	50	Excellent.	Gooding and Elzey
Curry	Russell Creek.	3S 14E 2E	"	5	0	0	100	0	0	Very poor.	Fort and Barker
	Fort Ord.	3S 14E 2E	"	5	0	0	100	0	0	Very poor.	Fort and Barker
	Mussey Creek.	3S 14E 2E	"	5	0	0	100	0	0	Very poor.	Elzey and Barker
	Purple Mt.	3S 14E 2E	"	5	0	0	100	0	0	Very poor.	Elzey and Barker
Wood River	Teale Creek.	1N 8E 1E	"	25	2	8	0	88	8	Good.	Gooding and Elzey
Jefferson	Netolus River.	11S 10E 1E	R. petiolare	15	1	6	0	100	0	Excellent.	Gooding and Barker
Marion	Devils Creek.	3S 7E 2E	R. bracteatum	50	1	2	0	100	0	Very poor.	Size
	Devils Creek.	3S 7E 2E	"	500	25	50	0	88	12	Good.	Gooding and Elzey
Folk	Teale City.	3S 6E 1E	"	100	10	10	0	100	0	Very poor.	Gooding and Elzey
	Teale City.	3S 6E 1E	"	100	10	10	0	100	0	Very poor.	Gooding and Elzey
Tillamook	Tilson River.	1N 6E 1E	"	100	3	30	0	100	0	Very poor.	Size
	Tilson River.	1N 7E 1E	"	50	2	30	0	100	0	Very poor.	Size
	W. Ridge.	4S 6E 1E	"	50	2	10	0	100	0	Very poor.	Size
	Salmon River.	3S 6E 1E	"	50	2	10	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	R. sempervirens	200	1	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	R. bracteatum	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
	Cochran.	3N 6E 1E	"	500	100	50	0	100	0	Very poor.	Size
Tesco	Reaper Creek.	5S 10E 1E	R. petiolare	100	1	1	0	100	0	Very poor.	Size
Washington	Cochran.	3N 7E 1E	R. bracteatum	500	100	50	0	100	0	Very poor.	Size
Yamhill	Grande Ronde	7S 6E 1E	"	25	2	10	0	100	0	Very poor.	Gooding and Elzey

# Excellent - Pines 100 feet or less from infected Pines.  
Very good - Pines 101 to 250 feet from infected Pines.  
Good - Pines 251 to 500 feet from infected Pines.  
Fair - Pines 1,001 to 1,500 feet from infected Pines.  
Very poor - Pines over 1,500 feet from infected Pines.  
\*See Putnam's studies of the Rhododendron region.







## ECOLOGY PROJECTS IN SOUTHERN OREGON, 1929

The ecology work of 1929 was carried on by one man. The work during the summer consisted in writing up and checking over the ecology plots that had been established during the two preceding years, and in making scouting trips into several locations, during which observations of an ecological nature were made.

The most of the plots are of such a nature that at least three or four seasons must elapse before any conclusive data can be obtained from them. Notes were taken on the progress of each plot, and of any changes that have taken place that would have ecological significance.

The following is a brief discussion of the location of these plots, together with a statement of the object for which each was established, some of the results observed and conclusions where there are sufficient data on which to base them.

Most of the plots were milacres, but some were strips and others were irregular in both extent and shape. Space does not permit of careful analysis of each plot. These data can be obtained from reports filed in the Corvallis office. Plots I to XVIII were established in the Prospect area; the others, in or near Still Creek. All were established in 1927 except where otherwise indicated.

Plots I and II were established in a R. Klamathense area to determine as many facts as possible regarding the growth of this species from the seedling stage. From the observations it seems evident that R. Klamathense comes in readily from seedlings in the soil in at least two years following eradication, but it requires a moist habitat for ecesis. This last point was shown by the fact that practically all of the young seedlings on the drier situations died, while many of those in the shadier and more moist situations survived.

Plot number III was established to secure data on the ecesis of R. cruentum in a lightly burned-over area. All the bushes were eradicated from the plot to be studied. No seedlings had appeared in 1928 or 1929, even where certain portions of the plot had been planted to this species.

Plot number IV, owing to its isolation, was not studied in 1929.

Plot number V was established to secure data on the vigor of growth and seed production of Ribes bushes where they were becoming suppressed by the forest cover. No data were taken on this plot in 1929 as it was considered that sufficient time had not elapsed to produce significant results.



# ECOLOGICAL PROBLEMS IN THE PACIFIC NORTHWEST

The ecology work of 1932 was carried on by one man. The work during the summer consisted in writing up and recording the data on the ecology plots that had been established during the past several years, and in making additional observations on several locations, which were made.

The most of the plots are of such a nature that at least three or four seasons must elapse before any comparative data can be obtained from them. Notes were taken on the progress of each plot, and of any changes that have taken place that would have ecological significance.

The following is a brief discussion of the location of the plots, together with a statement of the object for which they were established, some of the results observed and conditions which are sufficient data on which to base them.

Most of the plots were made in 1932, but some were made in 1931. The plots were made in both extent and shape. Space was not given of certain analysis of each plot. These plots can be obtained from reports filed in the Corvallis office. Plots I to VIII were established in the forest area; the others in or near still trees. All were established in 1932 except where otherwise indicated.

Plots I and II were established in a *Pinus ponderosa* area to determine as many facts as possible regarding the growth of this species from the seedling stage. From the observations it was found that *P. ponderosa* comes in readily from seedlings in the soil in at least two years following eradication, but it requires a longer time to reach maturity. This fact was shown by the fact that practically all of the young seedlings on the latter eradication died, while many of those in the earlier and more moist situations survived.

Plot number III was established to secure data on the growth of *P. ponderosa* in a light forest area. All the branches were established from the plot to be studied. No seedlings had been established in 1932, even where certain portions of the plot had been cleared to this extent.

Plot number IV, being in the forest, was not studied in 1932.

Plot number V was established to secure data on the growth of *P. ponderosa* and seed production of *Ribes cereum* when they were becoming suppressed by the forest cover. No data were taken on this plot in 1932 as it was considered that sufficient time had not elapsed to produce significant results.



Plot number V-a. The problem of this plot was to study the response of R. lobbiai to various treatments which it might readily receive in connection with eradication work. One bush was pulled, disturbing the soil about it as little as possible. In 1929 no seedlings or sprouts were found. Another bush was cut off at the crown and the soil cultivated. No new plants or sprouts were found in 1929. A third bush was pulled, the fruit shaken off and the soil cultivated. No seedlings or sprouts were found in 1929. A fourth bush was pulled, disturbing the soil as little as possible, and the fruit shaken off on the ground. No seedlings or sprouts were found. A fifth bush was left without being disturbed. In 1929 this showed signs of dying and had produced but few fruits, and no new growth. A sixth bush was left, but the soil about it was cultivated. No seedlings were found in 1929. From the above results it may be concluded that R. lobbiai does not produce seedlings readily through a mere disturbance of the soil, and that it does not sprout readily from the crown after being cut. This last point, however, is at variance with some further observations made on other plots.

Plot number VI was established for a study on the effect of suppression of R. lobbiai by the encroaching forest. No data, however, were taken on this plot in 1929 as it was thought that insufficient time had elapsed to produce notable results.

In Plot number VI-a, study was made of the effect of treatment of Ribes bushes similar to that which might be expected in eradication work. One R. lobbiai bush was cut off at the surface of the ground, and the soil above it cultivated. In 1929 this showed a healthy 2-year-old sprout. Another R. lobbiai left undisturbed and data taken in 1927 had apparently been removed by some one and no data could be taken in 1929. A R. sanguineum bush was grubbed out, but three root stubs with apparently no crown material were left. In 1929 one of these had several vigorous sprouts. Another R. lobbiai bush was pulled and the soil disturbed as little as possible. No seedlings or sprouts could be found in 1929. These results indicate that R. lobbiai or R. sanguineum may sprout as the result of leaving crowns after eradication, or in the case of R. sanguineum even from large roots left in the ground.

Plot number VII was laid out and planted to Ribes seeds in a 95 per cent shade situation to study germination. No seedlings could be found in 1928 or 1929. It is probable, however, that chipmunks dug up and ate all of the fruits. The plot will be observed next season.

Plot VIII was another plot established to study Ribes germination. It was located in an open burn. Careful examination in 1928 and 1929 showed no seedlings.



PLOT NUMBER I-2. The presence of this plot was ascertained  
 response of E. lobbi to various treatments which it was  
 receive in connection with investigation of the soil. The  
 disturbing the soil about 12 inches in 1932. In 1933 no  
 seedling or sprouts were found. Another plot was cut off at the crown  
 and the soil cultivated. No new plants or sprouts were found in 1932.  
 A third plot was pulled the first summer of 1933 and the soil cultivated.  
 No seedling or sprouts were found in 1932. A fourth plot was pulled  
 disturbing the soil as little as possible, and the first summer of  
 on the ground. No seedling or sprouts were found. A fifth plot  
 was left without being disturbed. In 1932 this showed signs of being  
 and had produced but few fruit, and no new growth. A sixth plot  
 was left, but the soil about 12 inches. No seedling or  
 found in 1932. From the above results it may be concluded that  
E. lobbi does not produce seedlings readily from the soil. It is  
 of the soil, and that it does not sprout readily from the soil  
 being cut. This last point, however, is a very small area. Further  
 observations made on other plots.

PLOT NUMBER VI was established for a study on the effect of  
 expression of E. lobbi by the surrounding forest. No seed, however,  
 were taken on this plot in 1932 as it was thought that seedlings  
 time had elapsed to produce seedlings.

In plot number VI-2, a study was made of the effect of  
 of E. lobbi bushes similar to that which may be observed in the  
 work. One E. lobbi bush was cut off at the surface of the ground,  
 and the soil above it cultivated. In 1932 this showed a healthy  
 sprout. Another E. lobbi bush was cut off and the soil  
 apparently been removed by some one and no data could be taken in 1932.  
E. lobbi bush was cut off, but the soil was not cultivated with  
 apparently no crown material was left. In 1932 one of these had  
 several vigorous sprouts. Another E. lobbi bush was pulled and the  
 soil disturbed as little as possible. No seedling or sprouts could  
 be found in 1932. These results indicate that E. lobbi or E. lobbi  
 may sprout as the result of leaving crown after excavation, or in the  
 case of E. lobbi even from large roots left in the ground.

PLOT NUMBER VII was laid out and divided into three sections in  
 33 per cent shade situation to study germination. No seedling could be  
 found in 1932 or 1933. It is probable, however, that seedlings were  
 present and the plot will be observed next season.

PLOT VIII was established for a study of the effect of  
 tion. It was located in an open burn. Careful examination in 1932  
 1932 showed no seedlings.



Plot IX was established to study the effects of burns of different character on the germination of seeds stored in the duff. The first milacre of this plot was subjected to heavy burning in 1927. Vigorous sprouts from the large R. cereum bush in the middle of the plot were three and four feet long. Another milacre on which no Ribes were present, which was subjected to a light burn, showed no seedlings. A similar plot from which the duff was all removed showed no seedlings. Another milacre used as a check plot, upon which a large R. cereum bush stood, showed no seedlings. Similarly, a bare area, undisturbed, showed no seedlings. Only one thing seemed strikingly evident from observations on this plot: R. cereum will stand heavy burning without being killed. Conclusions regarding germination are probably untimely at this point.

Plot number X was established to study the seeding and sprouting of R. binominatum. It consisted of five sub-plots. Sub-plot A consisted of 20 milacres and had all of the R. binominatum bushes removed (98 plants, 825 feet of live stem). No seedlings or sprouts were found in 1928 or 1929. Sub-plot B, consisting of one milacre, had a large service berry bush in the center with many R. binominatum bushes at its base. This plot was subjected to heavy burning. No seedlings or sprouts were found in 1928 or 1929. Sub-plot C consisted of one milacre of brushy ground with many R. binominatum bushes. This was subjected to light burning. In 1928 this showed many sprouts but no seedlings. In 1929 all of the sprouts had evidently died. Sub-plot D, consisting of one milacre with R. binominatum present, was carefully cleared. No seedlings or new sprouts were found in 1928, but in 1929 there was one discovered which had either been missed or was a sprout from a root or crown left in 1927. Sub-plot E, consisting of one milacre, had all the duff removed. No Ribes seedlings or sprouts had appeared in 1929.

Plot XI was established some distance from Plot X, but was planned to give further data on R. binominatum seeding and sprouting. It likewise was divided into four sub-plots. Sub-plot A had all the R. binominatum eradicated and the duff removed. No seedlings or sprouts were found in 1929. Sub-plot B was lightly burned, the R. binominatum not being removed (9 plants, 50 feet live stem). In 1929 there were several plants with two-year-old stems from the burned crowns, and these were well fruited. Sub-plot C (15 R. binominatum plants, 90 feet live stem) was not disturbed. In 1929 the Ribes had made vigorous growth. Sub-plot D had no Ribes removed, but was subjected to heavy burning. In 1929 there was no evidence of survival or seedlings.



Plot 11 was established to study the effects of a change of different character on the germination of seeds stored in the soil. The first milder of this plot was subjected to heavy burning in 1928. Vigorous sprouts from the large *E. corollae* were in the middle of the plot were three and four feet tall. No other milder of this plot were present, which was subjected to a light burn, showed no seedlings. A similar plot from which the soil was all removed showed no seedlings. Another milder was used as a check plot, from which a large *E. corollae* bush stood, showed no seedlings. Similarly, a large area, undisturbed, showed no seedlings. Only one tiny seedling appeared, which from observations on this plot: *E. corollae* will stand heavy disturbance being killed. Conclusions regarding germination are probably arrived at this point.

Plot number 12 was established to study the seedling of *E. dimorphum*. It consisted of two sub-plots. Sub-plot A consisted of 40 milder and had 40 of the *E. dimorphum* bushes removed (38 plants, 200 feet of line). No seedlings or sprouts were found in 1928 or 1929. Sub-plot B, consisting of the milder, had a large service berry bush in the center. In 1928, *E. dimorphum* bushes at the base. This plot was subjected to a light burn. No seedlings or sprouts were found in 1928 or 1929. Sub-plot C consisted of one milder of *E. dimorphum* grown with *E. dimorphum* bushes. This was subjected to light burn in 1928. In 1929 all of the sprouts had survived. Sub-plot D, consisting of one milder of *E. dimorphum* bushes, was carefully cleared. No seedlings or sprouts were found in 1928, but in 1929 there was one discovered which had a root of 1928. Sub-plot E, consisting of one milder, had all the soil removed in 1928. No sprouts had appeared in 1929.

Plot 13 was established to study the effects of a change of character on *E. dimorphum* seedling and sprouts. It was divided into four sub-plots. Sub-plot A had a large *E. dimorphum* bush removed and the soil removed. No seedlings or sprouts were found in 1928. Sub-plot B was a light burn. In 1928 there were several plants in the two-year-old bush from the burning, and these were well fruited. In 1929 the bush was removed. Sub-plot C (to *E. dimorphum* bushes, 30 feet) was not disturbed. In 1929 the bush was removed. Sub-plot D had no bushes removed, but was subjected to a light burn. In 1929 there was no evidence of survival or seedlings.



From the above it seems evident that R. binominatum is quite readily killed by fire, and that hand eradication with this species is effective.

Plot XII was established to study the effect of root competition and light intensity on germination of Ribes seeds. But since none of the seeds germinated on any of the plots, the results may be considered nil. A part of the difficulty with experiments of this kind is the damage done by squirrels and mice. This may even account for all of the lack of germination.

Plot XIII was established in 1928 to study the growth of R. cruentum. Data were taken on 21 separate plants that year, but the plot was not studied in 1929 because insufficient time had elapsed to bring about noticeable results.

Plot XIV was established in 1928. It consisted of a strip running through a burned-over area covered with a heavy growth of R. sanguineum and extending into a timbered area. From the data obtained it appears that burning the forest, together with the duff, results in a heavy ecesis of R. sanguineum.

Plot XV was established in 1928. Four milacres of land were cultivated to simulate the conditions which would be produced during the process of logging. In 1929 there was no evidence of Ribes seedlings.

Plot XVI was established in 1928 to study the effect of removal of the underbrush to increase the light intensity. All of the underbrush was cut on the plot and the light intensity increased to perhaps 25 per cent. No Ribes seedlings were observed in 1929.

Plot XVII was established in 1928 in an area in which a growth of R. hallii was being rapidly shaded by increasing forest growth. The Ribes were abundant on open burns. Data will be taken in 1930.

Plot XVIII was established in 1928. It consisted of four milacres in an area with a heavy growth of R. erythrocarpum. All of the plants were hand pulled. In 1929 there were no new plants, seedlings or sprouts to be found. This indicates that R. erythrocarpum yields readily to hand eradication.

#### Still Creek

Plot I. 96 milacres. Location: near Still Creek. (See 1927 report.) Purpose: to study growth and reproduction of R. sanguineum



From the above it seems evident that R. glaberrima is quite readily killed by fire, and that hand eradication with this species is effective.

PLOT XII was established to study the effect of root competition and light intensity on germination of mixed seeds. But since none of the seeds germinated on any of the plots, the results can be considered nil. A part of the difficulty with experiments of this kind is the damage done by squirrels and mice. This may even account for all of the lack of germination.

PLOT XIII was established in 1935 to study the growth of R. glaberrima. Data were taken on 31 separate plants that year, but the plot was not studied in 1936 because insufficient time was elapsed to bring about noticeable results.

PLOT XIV was established in 1936. It consisted of a strip running through a burned-over area covered with a heavy growth of R. sanguinalis and extending into a timbered area. From the data obtained it appears that burning the forest, together with the duty, results in a heavy escape of R. sanguinalis.

PLOT XV was established in 1938. Four microlots of 1000 were cultivated to simulate the conditions which would be produced during the process of logging. In 1939 there was no evidence of Ribes seedlings.

PLOT XVI was established in 1938 to study the effect of removal of the underbrush to increase the light intensity. All of the underbrush was cut on the plot and the light intensity increased to perhaps 25 per cent. No Ribes seedlings were observed in 1939.

PLOT XVII was established in 1938 in an area in which a growth of R. pallidum was being rapidly shaded by increasing forest growth. The Ribes were abundant on open ground. Data will be taken in 1939.

PLOT XVIII was established in 1938. It consisted of four microlots in an area with a heavy growth of R. erythronium. All of the plants were hand pulled. In 1939 there were no new plants, seedlings or sprouts to be found. This indicates that R. erythronium yields readily to hand eradication.

#### Still Creek

PLOT I. 98 microlots. Location: near Still Creek. (See 1937 report.) Purpose: to study growth and reproduction of R. sanguinalis.



on exposed heavily burned areas. Results: production of fruits heavy, but few seeds seem to germinate and the mortality is high. In 1928 a few seedlings were found, but in 1929 these had died out. Apparently conditions are not yet favorable for ecesis of new plants.

Plot II. 32 milacres. Location: a few yards up the slope from plot I. Purpose: to determine the ability of R. sanguineum to sprout from roots left in soil during eradication. Results: observations in 1928 and 1929 would indicate that no sprouting occurs from roots left in soil during eradication in the type of habitat studied (dry exposed hillside, with no duff, and low moisture content in summer).

Plot III. 32 milacres. Location: near plot II. Purpose: to compare efficacy of hand pulling with chopping off at crown, with respect to future sprouting. Results: The bushes of this plot were hand pulled. Observations during 1928 and 1929 revealed no evidence of sprouting from any plant parts left in the soil.

Plot IV. 8 milacres. Location: along a small stream, in a boggy place on the hillside near plots I, II and III. Purpose: to study the spreading of Ribes down a stream onto an eradicated area. The stream banks below the plot were examined in 1928 and 1929. A few seedlings were found. These might have been from seed from the eradicated bushes. Checks of the plot in 1930 and later will be more positive.

Plot V. 32 milacres. Location: near source of small stream west of Eureka Mountain. Purpose: to determine effect of increasing the shade on the growth of R. lacustre and R. bracteosum. To study the spread of Ribes down stream onto an eradicated area by means of fruits. Results: observations in 1928 and 1929 did not indicate much change in shade conditions. The stream was eradicated in 1928, so 1929 seedlings would not necessarily have come from the plot. The stream below the plot will be checked for seedlings in 1930.

Plot VI. This plot had to be eradicated because of infection with blister rust.

Plot VII. 48 milacres. Location: across Still Creek from Elister Rust Camp. Purpose: to check effectiveness of hand pulling as a means of eradicating R. bracteosum in an alder swamp. Results: R. bracteosum was eradicated from the plot in 1927. Observations in July 1928 showed many sprouts from old fragments left, and many seedlings. In August 1929 many of these seedlings had evidently died, as few were found then. It would seem that hand eradication in swampy places leaves many stem fragments that later produce more plants. Seedlings starting here had a high mortality.



on exposed heavily burned areas. Results: production of fruit heavy, but few seeds seem to germinate and the mortality is high. In 1932 a few seedlings were found, but in 1933 these had died out. Apparently conditions are not yet favorable for seeds of new plants.

Plot II. 32 miles. Location: a few yards up the slope from Plot I. Purpose: to determine the ability of *E. praeacutum* to sprout from roots left in soil during eradication. Results: observations in 1932 and 1933 would indicate that no sprouting occurs from roots left in soil during eradication in the type of habitat studied (dry exposed hillside, with no drift, and low moisture content in summer).

Plot III. 32 miles. Location: near Plot II. Purpose: to compare efficacy of hand pulling with chopping off at crown, with respect to future sprouting. Results: The bushes of this plot were hand pulled. Observations during 1932 and 1933 revealed no evidence of sprouting from any plant parts left in the soil.

Plot IV. 8 miles. Location: along a small stream, in a boggy place on the hillside near plots I, II and III. Purpose: to study the spreading of Ribes down a stream onto an eradicated area. The stream banks below the plot were examined in 1932 and 1933. A few seedlings were found. These might have been from seed from the eradicated bushes. Checks of the plot in 1930 and later will be more positive.

Plot V. 43 miles. Location: near source of small stream west of Buckeye Mountain. Purpose: to determine effect of increased shade on the growth of *E. praeacutum* and *R. bracteatum*. To study the spread of Ribes down stream onto an eradicated area by means of a flume. Results: observations in 1932 and 1933 did not indicate much change in shade conditions. The stream was eradicated in 1932, so that seedlings would not necessarily have come from the plot. The stream below the plot will be checked for seedlings in 1934.

Plot VI. This plot had to be eradicated because of infection with blister rust.

Plot VII. 43 miles. Location: across Bill Creek from Miller Rust Camp. Purpose: to check effectiveness of hand pulling as a means of eradicating *E. praeacutum* in an alder swamp. Results: *E. praeacutum* was eradicated from the plot in 1932. Observations in July 1932 showed many sprouts from old fragments left, and many seedlings. In August 1932 many of these seedlings had evidently died, as few were found then. It would seem that hand eradication in swampy places leaves many stem fragments that later produce more plants. Seedlings, being here had a high mortality.



Plots VIII and IX. Plot VIII-1 square chain. Plot IX--1x2 chains. Location: north slope of Eureka Mountain. Purpose: to determine the effectiveness of R. lacustre eradication in moist hillside bogs; spread of Ribes onto eradicated territory; rapidity of re-invasion of this type of habitat by R. lacustre. Results: observations in 1928 and 1929 show a large number of seedlings and several sprouts of R. lacustre on the area. Re-invasion promises to be fairly rapid. The area about the plot was eradicated chemically during 1929, and a careful check should be made of this during 1930.

Plot X. 4 square chains (approximately). Location: northwest of camp, on the slope. Purpose: to determine the probability of R. sanguineum bushes that have been pulled growing when partly covered with soil. Results: many R. sanguineum plants were partly covered and the site of each marked and numbered. The recheck of these in 1928 showed 1 feeble sprout and several seedlings. In August 1929 no plant was found sprouting, and no seedlings were noted, or one-year-old plants. Observations on this and other plots would indicate that 1929 was unfavorable for ecesis of Ribes. (1929 was an unusually dry summer.)

Plot XI. 84 milacres. Location: Below plots I, II and III in wooded swampy area. Purpose: to determine whether R. bracteosum parts, partially buried during eradication, have a strong tendency to sprout. Results: A high per cent (34%) of the plants partly buried were reported in 1928 as rooting or sprouting. Data on separate plants were not taken in 1929.

#### Wind River Nursery, 1929.

During August 1929, a check was made of certain portions of the hill slopes eradicated in 1927. It was reported that in 1928 certain areas from which R. sanguineum had been eradicated in 1927 were found to have many seedling Ribes on them. A careful check of these areas in 1929 (August) did not reveal any 1928 or 1929 seedlings.

It is probable that the season 1929 (a very dry one) produced a high mortality among Ribes plants that were just becoming established in many areas.

#### Scouting

Scouting trips to collect ecology data were made along the old wagon road to Huckleberry City, to the ridge west of Union Peak and a few shorter trips adjacent to the ecology plots. These trips were for collecting data on abundance and distribution of Ribes species in relation to various habitat conditions such as altitude, shade, soil, exposure and soil moisture, special attention being paid to associations with white pines.







The most thorough single scouting project (in the Crater Lake National Park) has been treated in a separate report.

#### Summary

The following general conclusions may be drawn:

1. Ribes klamathense (a possible serious species for consideration in blister-rust control) requires a very moist habitat for the seedlings to become established.

2. Chipmunks play a very important role in keeping in check such species as Ribes cruentum.

3. Ecdysis of some species of Ribes (R. cruentum and R. lobbii) seems to have taken place during certain favorable seasons rather than each year. The causes of this have not yet been determined.

4. Ribes erythrocarpum can probably be eradicated thoroughly and effectively by hand pulling.

These ecology plots were established in late summer of 1927 and 1928, so more definite data will be expected in 1930 and 1931. Some plots were found to have been damaged by various agencies such as chipmunks, cattle and hunters (by pulling up stakes).

#### CRATER LAKE NATIONAL PARK

##### White Pine

A general survey was made of the Crater Lake National Park in 1929 to get ecological data and to study the region from a pre-eradication standpoint. The following notes were taken:

o Anna Creek: Western white pines are scattered along both banks of Anna Creek, from Bridge Creek to near the south entrance of the park. A good stand was reported by several park workers to be found north of Anna Creek, and west of Crater Peak.

Union Peak: Very little western white pine was found on the trail to Union Peak, but there are a few trees on the base of the peak itself.

Road to the east entrance of the park: At places along this road, especially where it enters Kerr Valley, there is much scattered western white pine.



The most thorough and accurate account of the Great Lakes  
has been recorded in a separate report.

#### Summary

The following general conclusions may be drawn:

1. Ribes hians (a possible serious species for consideration  
in later-harvest control) requires a very moist habitat for the seedlings  
to become established.

2. Cypripedium play a very important role in keeping in check such  
species as Ribes cereum.

3. Losses of some species of Ribes (R. cereum and R. hians)  
seems to have taken place during a certain favorable season rather than  
each year. The causes of this have not yet been determined.

4. Ribes erythrocarpum can probably be eradicated entirely and  
effectively by hand pulling.

These ecology plots were established in late summer of 1937  
and 1938, so more definite data will be expected in 1939 and 1941.  
Some plots were found to have been damaged by various agencies such as  
chipmunks, cattle and hunters (by pulling up stakes).

#### CATTLE LAKE NATIONAL PARK

##### White Pine

A general survey was made of the Greater Lake National Park  
in 1938 to get ecological data and to study the region from a geo-  
graphical standpoint. The following notes were taken:

Anna Creek: Western white pines are scattered along both banks  
of Anna Creek, from Bridge Creek to near the south entrance of the park.  
A good stand was reported by several park visitors to be found north  
of Anna Creek, and west of Grater Peak.

Union Peak: Very little western white pine was found on the  
trail to Union Peak, but there are a few trees on the base of the peak  
itself.

Trail to the east entrance of the park: A good stand of  
western white pine is especially dense in the Kern Valley, where it meets  
western white pine.



Mt. Scott: On the upper slopes of the mountain, about 8,000 feet altitude and above, white-bark is about the only tree. It occurs in places in a fairly dense stand of scrubby trees.

Cloudcap: This peak is covered with a fine growth of white-bark pine, with an intermixture of lodgepole pine and mountain hemlock.

Crater rim: In many places the rim comes up to a rather sharp ridge, and dips off in a steep slope to the lake. These high, sharp ridges are often occupied by a pure stand of scrubby white-bark pine, or by a mixture of white-bark pines and hemlock. These stands are especially noticeable north of Kerr Notch, above Red Cloud Cliff (opposite Cloudcap), and near Glacier Peak and the Watchman.

Rim road: Along Rim road from Cloudcap to the Watchman, white-bark-pines occur almost everywhere. In some places these are widely scattered, while in others there are small patches with a high per cent of white-bark pines.

Watchman: The Watchman has a heavy stand of white-bark pines on the west slope.

Slopes of the Crater, to the water's edge: In a trip through the country around the east shore of the lake, it was found that western white pine made up a considerable per cent of the trees found on these steep slopes. The region between Sentinel Rock and the Felisades has in places a considerable growth of western white pines on the less precipitous slopes (e.g., near the Wineglass).

### Ribes

Anna Creek (at the Garden of the Gods): Considerable Ribes lacustre or prickly current was found growing along the banks of the stream. General observations indicate that this condition is typical of most of the streams in the southeast part of the park. The steep walls of the canyon had occasional patches of Ribes binominatum, or Siskiyou gooseberry, and R. erythrocarpum, or Crater Lake current. The latter was very abundant on the more level areas just above the canyon.

Mt. Scott and Cloudcap: The scouted parts of this territory showed the Ribes species to be scattered and rather scarce.

Crater rim: The sharp ridges between Kerr Notch and Cloudcap were found to be occupied in many places with dense mats of Ribes erythrocarpum. In several locations, these mats grew under or quite near the patches of white-bark pine previously mentioned. This condition is probably more or less general around the entire rim. The points where



Mt. Scott: On the upper slopes of the mountain, about 8,000 feet altitude and above, white-bark is about the only tree. It occurs in places in a fairly dense stand of scrubby trees.

Cloudcap: This peak is covered with a fine growth of white-bark pine, with an intermixture of lodgepole pine and mountain hemlock.

Grater rim: In many places the rim comes up to a higher, sharp ridge, and dips off in a steep slope to the lake. These sharp ridges are often occupied by a more stand of scrubby white-bark pine, or by a mixture of white-bark pines and hemlock. These ridges are especially noticeable north of Kerr Notch, above Red Cloud Cliff (opposite Cloudcap), and near Glacier Peak and the Wetmore.

Rim road: Along the road from Cloudcap to the Wetmore, white-bark pines occur almost everywhere. In some places these are widely scattered, while in others there are small patches with a high per cent of white-bark pines.

Wetmore: The Wetmore has a heavy stand of white-bark pines on the west slope.

Slopes of the Grater, to the water's edge: In a few places the country around the east shore of the lake, it was found that western white pine made up a considerable per cent of the trees found on these steep slopes. The region between Sentinel Rock and the Wetmore has in places a considerable growth of western white pine on the less precipitous slopes (e.g., near the wineglass).

### Hibes

Anna Creek (at the border of the lake): Considerable Hibes lauratus or P. lauratus was found growing along the banks of the stream. General observations indicate that this condition is typical of most of the streams in the southern part of the park. The steep walls of the canyon had occasional Hibes lauratus, or Hibes lauratus, or Hibes lauratus, or Hibes lauratus. The latter was very abundant on the more level areas just above the canyon.

Mt. Scott and Cloudcap: The scattered parts of this territory showed the Hibes species to be scattered and rather scarce.

Grater rim: The sharp ridges between Kerr Notch and Cloudcap were found to be occupied in many places with dense runs of Hibes lauratus. In several locations, these runs grew under or on the near the bases of white-bark pines previously mentioned. This condition is probably more or less general around the entire rim. The points where



such associations of white pine and R. erythrocarpum were noted, were: Cloudcap Cliff, near the Wineglass, and near Glacier Peak and the Watchman.

Slopes of the Crater: In the region near the Wineglass.

R. viscosissimum, or sticky currant, was found growing in association with the white pines. R. lacustre occupies large patches along small streams flowing into the lake, e.g., at the old boat landing and at the end of the old trail.

#### Summary

These preliminary scouting trips indicate the situation in Crater Lake National Park to be somewhat as follows:

1. Large areas of the park have either no white pines, or often only a negligible number.
2. Many of the streams (e.g., Anna Creek, Sand Creek) are fringed with stands of western white pine of varying degrees of density, in association with Ribes lacustre and other Ribes species.
3. The Crater Rim is occupied in many places by extensive growths of white-barked pine, and in many places heavy mats of R. erythrocarpum are associated with the pines. These often occupy prominent and scenic locations. Protection of these patches of white-bark pine would, in places, involve the eradication of considerable quantities of Ribes plants, while in places such as parts of Cloudcap Mountain, the Ribes associated with white pines are few in number.

Areas that demand most immediate attention are:

1. The rim, entirely around the Crater and probably extending back several hundred yards.
2. The Cloudcap area and Mt. Scott.
3. The inner rim of the crater, at such places as seems desirable (e.g., below Kerr Notch and above Grotto Cove).
4. Anna Creek.

Any program of protection should be flexible, and the plan should be to extend the protection work to all areas of the park that may be in need of protection, as such are revealed by more intensive investigation.

☐ Ribes albicaule Area

☒ Ribes erythrocarpum Area



such associations of white pine and R. leucostictum were noted, near  
Cloughs Hill, near the lineages, and near Cloughs Hill and the  
Watchman.

Species of the forest: In the region near the lineages,  
R. leucostictum, or stictum, was found growing in association  
with the white pines. R. leucostictum occupies large areas along the  
stream, flowing into the lake, e.g., at the old boat landing and at the  
end of the old trail.

### Summary

These preliminary sections indicate the situation in  
Cloughs Hill National Park to be as follows:

1. Large areas of the park have either no white pines, or offer  
only a negligible number.

2. Many of the streams (e.g., Anna Creek, Lake Creek) are fringed  
with stands of western white pine of varying degrees of maturity, in  
association with Ribes lanceolatum and other alpine species.

3. The Great R. is occupied in many places by extensive stands  
of white-barked pine, and in many places heavy mats of R. leucostictum  
are associated with the pines. These often occupy prominent and strategic  
locations. Protection of these outcrops of white-barked pine would, in  
places, involve the eradication of considerable quantities of Ribes  
plants, while in places such as parts of Cloughs Hill, the pines  
associated with white pines are few in number.

Areas that demand most immediate attention are:

1. The rim, entirely around the Cloughs Hill, probably extending  
back several hundred yards.

2. The Cloughs Hill and S. Cliff.

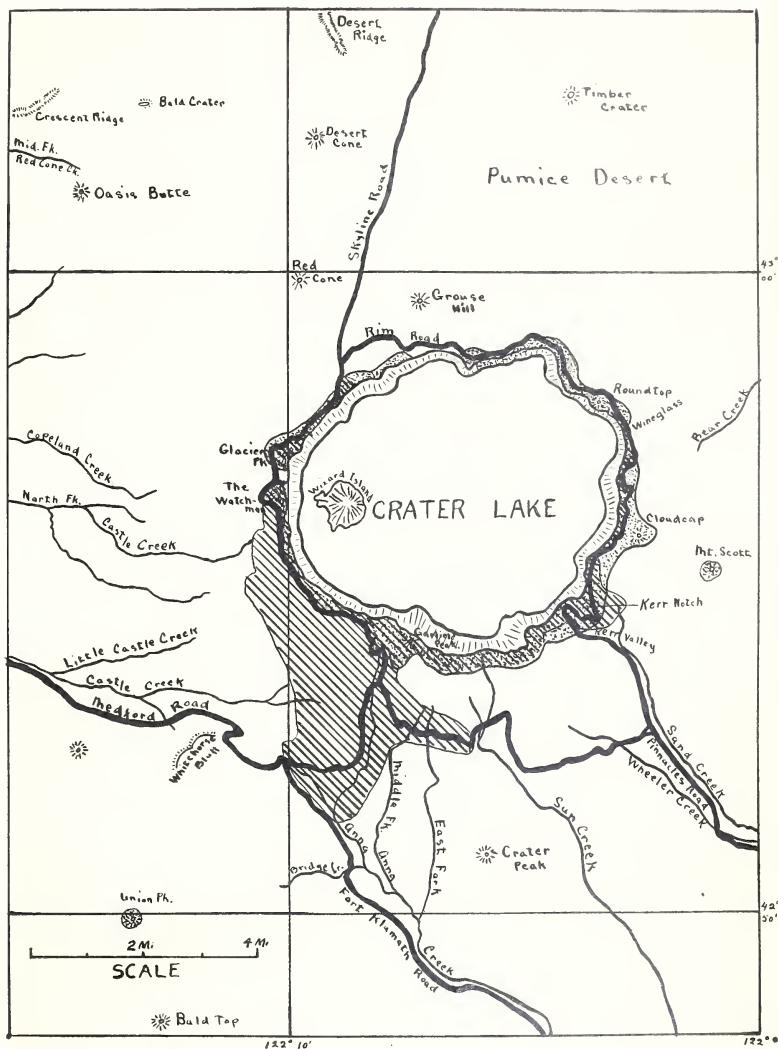
3. The inner rim of the crater, at some places as some distance  
(e.g., below Kerr Notch and above Grotto Cove).

4. Anna Creek.

Any program of protection should be flexible, and the plan  
should be to extend the protection work to all areas of the park that  
may be in need of protection, as such are revealed by more intensive  
investigation.



# CRATER LAKE NATIONAL PARK



Pinus albicaulis Area



Ribes erythrocarpum Area

Data by F.P. Sipe

Map by L.N. Goodding.

1/16/30







BLISTER-RUST CONTROL WORK IN CALIFORNIA

1929

Blister-rust-control work in California was carried on, as in the past, as a cooperative project between the California Department of Agriculture, California State Board of Forestry, College of Agriculture of the University of California, Department of Botany of the University of California and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was made effective July 1, 1927 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work as organized for the Federal fiscal year 1930, beginning July 1, 1929:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1927

Between  
THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY  
and the  
CALIFORNIA DEPARTMENT OF AGRICULTURE - - - THE CALIFORNIA STATE  
BOARD OF FORESTRY - - - and the COLLEGE OF AGRICULTURE,  
UNIVERSITY OF CALIFORNIA.

Cooperative Work in Controlling White Pine Blister Rust in  
CALIFORNIA

\* \* \*

Section D of the Memorandum of Understanding described above reads as follows:

"The College of Agriculture, University of California, agrees to:

- "(1) Assist employees of the Bureau of Plant Industry, through the University Division of Forestry, by furnishing available technical advice and records;
- "(2) Provide laboratory facilities, through the University Division of Plant Nutrition, for employees of the Bureau of Plant Industry who are stationed in California to conduct technical studies upon the feasibility of chemical eradication of Ribes."

This section shall be amended as follows:

- (1) Assist employees of the Bureau of Plant Industry, through the Division of Forestry of the College of Agriculture, by furnishing available technical advice and records;
- (2) Provide laboratory facilities, through the Division of Plant Nutrition of the College of Agriculture, for employees of the Bureau of Plant Industry who are stationed in California to conduct



LIST OF MOST COMMON WORDS IN CALIFORNIA

1-20

Assistant-plant-control work in California was carried out in the past, as a cooperative project between the California Department of Agriculture, California State Board of Forestry, Division of Forestry, University of California, Department of Botany of the University of California and the Bureau of Plant Industry. The basic memorandum of understanding upon which this work was organized was dated effective July 1, 1937 and can be found in the report for that calendar year. The following is the amendment to this memorandum to cover the work organized for the Federal fiscal year 1938, beginning July 1, 1937:

AMENDMENT TO  
MEMORANDUM OF UNDERSTANDING  
Effective July 1, 1937

Between

THE UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF PLANT INDUSTRY

and the

CALIFORNIA DEPARTMENT OF AGRICULTURE, DIVISION OF FORESTRY

BOARD OF FORESTRY, - - - and the

UNIVERSITY OF CALIFORNIA.

Cooperative work in controlling white pine blister rust in California

"

Section 2 of the Memorandum of Understanding described above reads as follows:

"The College of Agriculture, University of California, agrees to:

- "(1) Assist employees of the Bureau of Plant Industry, through the University Division of Forestry, by furnishing available technical advice and records;
- "(2) Provide laboratory facilities, through the University Division of Plant Industry, for employees of the Bureau of Plant Industry who are stationed in California to conduct technical studies upon the feasibility of chemical control of blight."

This section shall be amended as follows:

- (1) Assist employees of the Bureau of Plant Industry, through the Division of Forestry of the College of Agriculture, by furnishing available technical advice and records;
- (2) Provide laboratory facilities, through the Division of Plant Industry of the College of Agriculture, for employees of the Bureau of Plant Industry who are stationed in California to conduct



technical studies upon the feasibility of chemical eradication of Ribes.

(3) Provide laboratory and greenhouse facilities and technical advice, thru the Division of Pomology of the College of Agriculture, to permit the necessary increase in experimental work on chemical eradication of Ribes;

(4) Assist the employees of the Bureau of Plant Industry, engaged in technical investigation of the chemical eradication of Ribes, by furnishing, thru the Department of Botany, technical advice and laboratory space.

Paragraph E-6 of the Memorandum of Understanding described above contains the following:

"For the Fiscal Year 1928, the Bureau of Plant Industry shall contribute in value approximately \$19,000 to the support of this cooperative work, the California Department of Agriculture approximately \$9,000, the California State Board of Forestry approximately \$5,000, and the College of Agriculture, University of California shall contribute in value approximately \$3,000; thereafter the amount to be contributed by each shall be determined and agreed upon by supplemental correspondence."

In accordance with the foregoing provisions, it is mutually agreed that for the fiscal year ending June 30, 1930, there will be contributed in value by the California Department of Agriculture approximately \$9,000, by the California State Board of Forestry approximately \$3,000, by the College of Agriculture, University of California approximately \$10,000 by the Department of Botany, University of California, approximately \$2,000, and by the United States Department of Agriculture, Bureau of Plant Industry through its Office of Blister Rust Control, approximately \$42,000 in connection with cooperative blister rust control work in California.

Date:

Signature:

9/16/29

(s) G. H. Hecke  
Director, California Department of Agriculture

9/18/29

(s) M. E. Pratt, by W. E. Rider, Deputy  
State Forester, California State Board of Forestry

10/5/29

(s) E. D. Merrell  
Dean, College of Agriculture, University of California

9/10/29

(s) W. A. Setchell  
Department of Botany, University of California

10/28/29

(s) W. A. Taylor  
Chief, Bureau of Plant Industry



technical studies upon the feasibility of chemical analysis of drugs.  
 (3) Provide laboratory and research facilities and equipment, advice, thru the Division of Forensic Chemistry, to permit the necessary increase in experimental work on chemical analysis of drugs;  
 (4) Assist the employees of the Bureau of Plant Industry, engaged in technical investigation of the chemical analysis of drugs, thru the Department of Botany, technical advice and laboratory space.

Paragraph 5-6 of the Memorandum of Understanding described above contains the following:

"For the fiscal year 1938, the Bureau of Plant Industry shall contribute in value approximately \$1,500 to the work of this cooperative work, the California Department of Agriculture approximately \$8,000, the California State Board of Forestry approximately \$5,000, and the State of California, University of California shall contribute in value approximately \$5,000; thereafter the amount to be contributed by each shall be determined and agreed upon by mutual consent."

In accordance with the foregoing provisions, it is hereby agreed that for the fiscal year ending June 30, 1938, there will be contributed in value by the California Department of Agriculture approximately \$8,000, by the California State Board of Forestry approximately \$5,000, by the College of Agriculture, University of California approximately \$5,000, by the Department of Botany, University of California, approximately \$5,000, and by the United States Department of Agriculture, Bureau of Plant Industry, through the Office of Master Seed Control, approximately \$1,500, in connection with cooperative work in U.S. Laboratory.

Date:	Signature:
2/18/38	(s) G. H. Yecke Director, California Department of Agriculture
2/18/38	(s) A. R. Pratt, Jr. State Forester, California State Board of Forestry
10/12/38	(s) E. R. Barrett Dean, College of Agriculture, University of California
2/10/38	(s) R. A. Stetson Department of Botany, University of California
10/28/38	(s) W. A. Taylor Chief, Bureau of Plant Industry



## BLISTER RUST ACTIVITIES IN CALIFORNIA, 1929

By

George A. Root,  
Assistant Pathologist.

Reports on the work under way in California have been prepared by the several project leaders concerned. The reports are by the same leaders as in 1928 -- ecological studies of Ribes by F. A. Patty; control reconnaissance by T. H. Harris; experimental Ribes eradication and pre-eradication on the Plumas National Forest by W. V. Benedict. These follow the proceeding report. The account of the investigations of Ribicides in California is incorporated in R. R. Offord's special report.

### BLACK CURRANT ERADICATION

As in former years, work on this particular project has not deviated from the usual procedure. Five men were employed with transportation furnished by three automobiles. The work started July 1 and continued over a period aggregating 13 man months. All the scouts were experienced men. The territory covered involved a wide range of conditions -- from a heavily populated area of many gardens and orchards with considerable water to sparsely settled areas with a scarcity of water in evidence. All this had a bearing upon the rate of progress of the work. The area covered in 1929 was about what was contemplated.

TABLE NO. 1.

#### PLANTINGS AND BUSHES ACCORDING TO COUNTIES

County	No. Plantings	No. Bushes
Santa Clara	20	133
Santa Barbara	1	3
Ventura	1	24
Los Angeles (3/4 completed)	0	0
*Sacramento	3	6
Total	25	166

\*New or missed plantings since survey in 1927.

Contrary to expectations the number of plantings and bushes found this year was the smallest of any season. This can be partly accounted for by the type of country covered and then again by the six years' agitation against the black currant which has brought about the



# REPORT ON ACTIVITIES IN CALIFORNIA, 1932

George A. Root,  
Assistant Entomologist.

Reports on the work under way in California have been presented by the several project leaders concerned. The reports are of the same nature as in 1931 -- ecological studies of Nippon by J. A. Rehn; control of the spruce sawfly by T. H. Harris; experimental riped eradication and eradication on the Plumas National Forest by W. V. Leachman. These follow the preceding report. The account of the investigation of Nippon in California is incorporated in L. E. Davis's special report.

## WORK COVERED IN 1932

As in former years, work on this particular project has been divided from the rural districts. This has been emphasized in the report furnished by three entomologists. The work started July 1 and continued over a period extending to the end of the year. The territory covered involved a wide range of conditions -- from a heavily populated area of the Sacramento and surrounding areas with considerable water to sparsely settled areas with little or no water in evidence. All this was done upon the basis of progress of the work. The area covered in 1932 was about what was covered in 1931.

## PLANTING AND BUREAU ACCOUNTING BY COUNTY

County	Plantings Made	Plants
Santa Clara	100	100
Santa Barbara	100	100
Yuba	100	100
Los Angeles (8/4 completed)	100	100
*Sacramento	100	100
Total	500	500

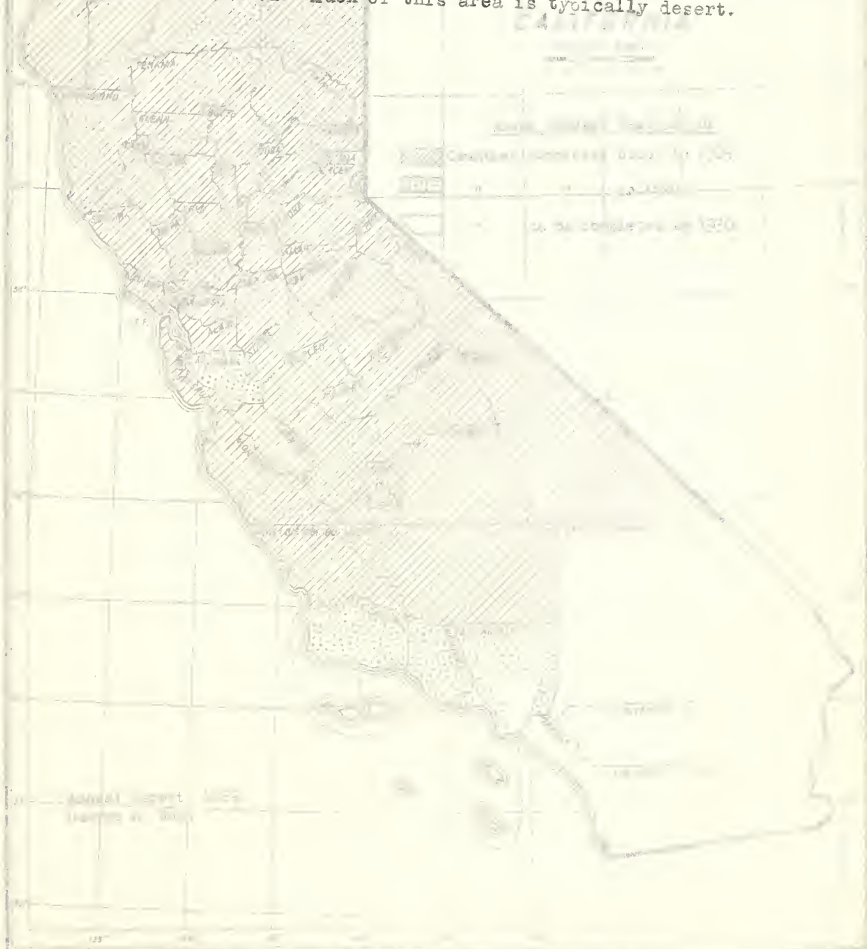
\*New or missed plantings since survey in 1931.

Contrary to expectations the number of plantings in 1932 was the smallest of any season. This can be accounted for by the type of country covered and then again by the fact that the current winter was not so severe as the previous years; agitation against the Nippon current winter was not so great as in 1931.



removal of many bushes by the owners themselves during this period. At least 25 plantings, comprising 50 or more bushes, were reported as being removed in this manner.

The state is nearly completed. Five counties and a portion of another are all that remain. One of these and the greater portion of two others can be eliminated. Much of this area is typically desert.

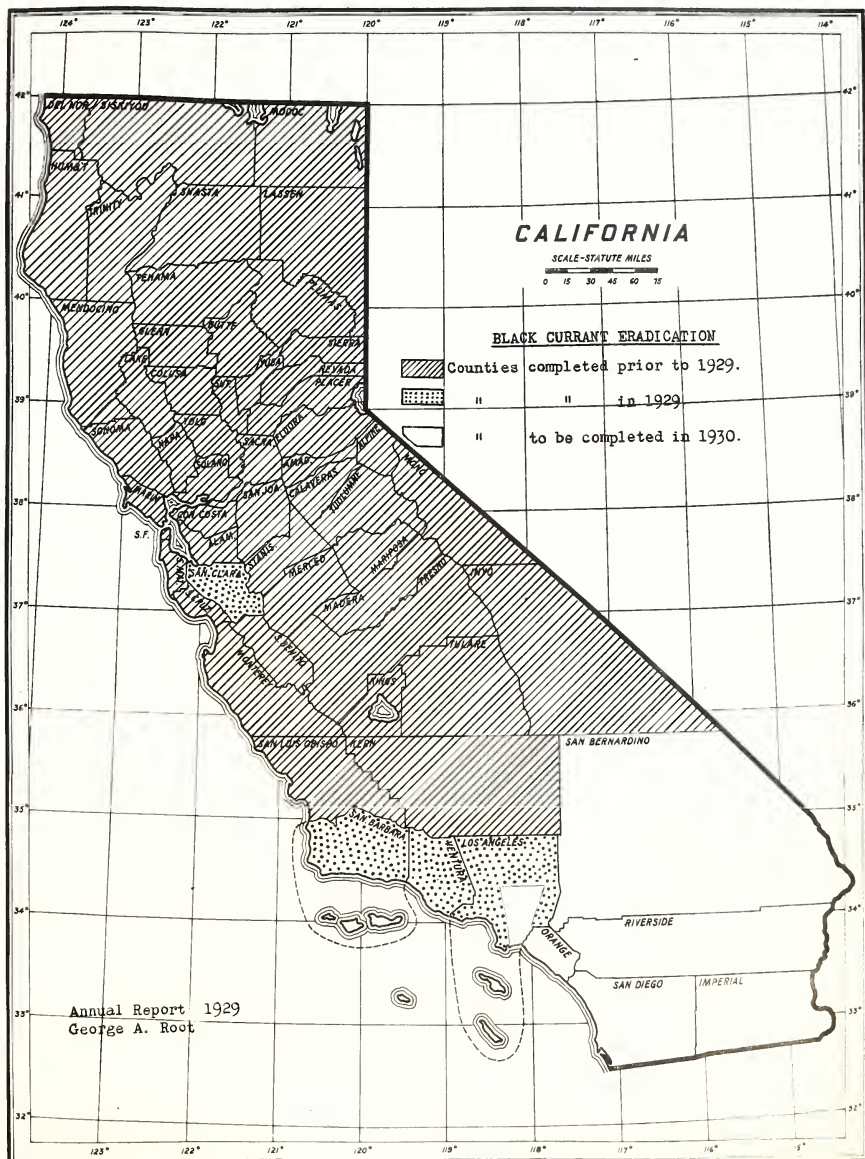




removal of many houses by the owners themselves during the war.  
At least 25 plantings, consisting of 1 more house, were reported as  
being removed in this manner.

The state is nearly completed. Five counties and a portion of  
another are all that remain. One of these and the western portion of  
others can be eliminated. Most of this area is typically desert.











Tentative plans call for a decrease in funds allotted to this project. This will mean that there will be no organized crews next year but that the State Leader with the help of the agricultural commissioners and their inspectors will endeavor to finish the remaining counties-- a part of Los Angeles, and all of Orange, San Bernardino, Riverside, Imperial and San Diego. All indications point to a satisfactory completion in this manner.

A check was made of the black currant work done in Alpine County in 1927. With a population of less than 300, ten plantings comprising 92 bushes were found. The check revealed but two places where bushes (sprouts) were still present. On one place, one sprout had come from an original planting of 12 bushes and on the other, two sprouts had come from one of 19 bushes. No missed plantings were discovered nor any as replants. There was a feeling that some bushes might have come in from the Carson Valley in Nevada, adjoining eastern Alpine County.

#### NURSERY INSPECTION AND QUARANTINE MATTERS

The nurseries in the counties where the black currant work took place were visited by the scouts and host plants, especially 5-needled pines, were inspected. This species is gradually disappearing from the nurseries of the state. Close touch is kept through the Office of the Superintendent of Nursery Service on the establishment of new nurseries and their status regarding the type of stock to be grown.

The discovery of the Mediterranean fruit fly in Florida last April gave an added impetus to quarantine activities in this state. Funds were provided whereby six quarantine stations were established on the Oregon-California line. They are situated on the main highways leading into California and primarily for the interception of contra-band fruit. All material prohibited entry, including blister-rust hosts, are taken. Reports have shown the interception of either currants, gooseberries or pines at some station each month since their inception last May.

#### EDUCATIONAL WORK

This continues to be an important part of the blister-rust program. Government and state agencies realize more than ever the necessity for this work in successfully carrying out their various projects.

##### A. Panel Exhibits

The 5-panel exhibit has been used as in the past in conjunction



Representative Jones said that a committee on the subject of the project. This will mean that there will be no organized group to represent but that the State Board of Health will be the official commission and that the project will be under the supervision of the State Board of Health. Jones said that the project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health.

It was also stated that the project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health. The project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health.

### THE PROJECT AND THE STATE BOARD OF HEALTH

The project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health. The project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health.

The discovery of the project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health. The project is a part of the State Board of Health and that it is a part of the State Board of Health. All information should be sent to the State Board of Health.

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with the black currant project. Placed in store windows or other available places, it has helped carry the message to many people. With the probable termination of the black currant program in 1930, those panels dealing with the black currant exclusively are to be replaced with those showing the other projects carried on in the state. These panels will still find a use in the educational work, being displayed where lectures are given and forming the center, around which can be built very satisfactory demonstrations for small agricultural fairs.

#### B. Blister Rust Film

This was shown at three different agencies this year: the theater, school and agricultural fair. It was shown in theaters in two towns and in one national park before an audience of 4,100 people; in one high school before several classes aggregating 300 pupils and at one agricultural fair before 1,200 persons, making a total of 5,600 people. The western blister-rust film will lose some of its real value with the termination of the black currant work. There should be a new film showing work of the other projects.

#### C. Exhibits

The placing of blister rust demonstrations at agricultural fairs still continues to be one of the best means for educational propaganda. Space at the State Fair in Sacramento was at a premium so adequate room for a large display was not available. However, enough space was provided for a display of Riker mounts in connection with the exhibit of the State Department of Agriculture.

A very good demonstration was set up at the Santa Maria Valley Fair in Santa Barbara County. At the Los Angeles County Fair in Pomona, a separate booth was available for a creditable demonstration. At the Southern California Fair in Riverside, one wing of the State Department of Agriculture's exhibit was used for blister rust. All these demonstrations were set up by the black currant scouts and reports from outside sources indicated very good work.

Specimens of the rust were left at the Santa Barbara Museum in Santa Barbara and at the museums in the Yosemite and Lassen National Parks, respectively.

#### D. Talks

The personal touch occasioned by talks has its advantages. There is usually more interest manifested by the audience, in hearing from one closely associated with the work.



With the black current project, placed in such a place or other available places, it was judged that the message to many people, with the probable formation of the black current problem in 1963, those panels dealing with the black current exclusively, to be replaced with those showing the other projects carried on in the field. These panels will still find use in the educational work being displayed where lectures are given and for the display of the can be built very a satisfactory demonstration for small groups.

6. After first time

[illegible]

C. K. J. J.

The following information was provided for the purpose of the investigation of the above-mentioned matter. The information was obtained from the files of the Department of the Interior, Bureau of Land Management, and is being furnished to you for your information. The information is being furnished to you for your information and is not to be used for any other purpose.

very good demonstration was set up at the Santa Anita Fair in Santa Barbara County. At the San Joaquin County Fair in Fresno, a separate booth was available for a creditable demonstration. At the Southern California Fair in Riverside, one of the State Foresters of California's exhibit was used for district work. At these demonstrations were set up by the district scout and the outside forces indicated very good work.

442.0

There is usually more interest manifested by the audience, in hearing from one closely associated with the work.



During February a talk supplemented by lantern slides was given before a Boy Scout troop at Elk Grove in Sacramento County. In April, a talk was given before the biology classes of the Polytechnic High School at Long Beach. Lantern slides were used. During July, at the invitation of the Park Naturalist of Yosemite Park, several talks, accompanied by lantern slides, were given before camp groups and an assembly of guests at one of the hotels. The blister-rust work was presented to the Yosemite school of nature study, a group comprising teachers and others particularly interested in the natural sciences. The national park affords excellent opportunity for educational work.

At this point may be mentioned the interview with the Yosemite Park authorities, who are aware of the potential menace of the rust. Their desire is to keep all tree species in the park as free as possible from insect pests and plant diseases. The success which they obtain or will obtain seems to depend largely upon the amount of funds available.

One of the black currant scouts, H. P. Backus, gave a talk before the Rotary Club at Carpinteria in Santa Barbara County. On December 18, a radio talk on blister rust was broadcasted from the station of the State Department of Agriculture in Sacramento.



During the night a talk supplemented by lantern slides was given before a Boy Scout troop at Elk Grove and Sacramento County. At the same time a talk was given before the biology classes of the Polytechnic High School at Long Beach. Lantern slides were used. During the day at the invitation of the Park Naturalist of Yosemite Park, several talks, accompanied by lantern slides, were given before camp groups and an assembly of guests at one of the hotels. The latest talk was presented to the Yosemite school of natural study, a group comprised of teachers and others particularly interested in the natural sciences. The national park affords excellent opportunity for educational work.

At this point may be mentioned the interview with the Yosemite Park authorities, who are aware of the potential menace of the insect. Their desire is to keep all tree species in the park as free as possible from insect pests and plant diseases. The success which they obtain will obtain seems to depend largely upon the amount of funds available.

One of the black current growers, B. L. Backus, gave a talk before the Rotary Club at Gardnerville in Santa Barbara County. On December 18, a radio talk on blight was broadcasted from the station of the State Department of Agriculture in Sacramento.





Annual Report 1929  
G. A. Root







## L. Newspapers

The newspaper is still one of the best agencies, through which to reach the public locally. Since the inception of the black currant work, it has been used extensively as a means of publicity. During 1929, articles have appeared in 23 newspapers distributed over four counties where eradication work was in progress.

Space was given for a blister rust article in the October issue of Yosemite Nature Notes, a monthly publication of the Educational Department of Yosemite National Park.

## SCOUTING FOR THE DISEASE

The spread of the rust southward in Oregon has created no little interest as to the time of its inevitable entrance into California. Its discovery on the western coast of Oregon in 1928, at a point 100 miles south of the Columbia River made it imperative to scout at least the northwestern part of this state in 1929.

Scouting was started in Del Norte County on September 18, after the completion of work on the other projects. No infections were found.



The newspaper is still one of the best mediums through which to reach the public locally. Since the inception of the disease control work, it has been used extensively as a means of publicity. During 1929, articles have appeared in 35 newspapers distributed over 1000 counties where eradication work was in progress.

Space was given for a list of first prize articles in the October issue of Yosemite Nature Notes, a monthly publication of the Department of Yosemite National Park.

### SCOUTING FOR THE DISEASE

The spread of the rust southward in Oregon was checked by little interest as to the time of its inevitable entrance into California. Its discovery on the western coast of Oregon in 1927, at a point 100 miles south of the Columbia River made it imperative to scout at least the northwestern part of this state in 1928.

Scouting was started in Del Norte County on September 12, after the completion of work on the other projects. No infections were found.



TABLE NO. 2.

## INSECTION POINTS IN DEL NORTE COUNTY, CALIFORNIA

Locality	Species Examined	Pine Ass'n.	Remarks	Inspectors	Date
Tarup Creek, tributary of Klamath River.	R. bracteosum	*Very poor	-	Benedict and Miller.	9/20/29
Along creek on road leading from Redwood Highway to Requa - 1/4 mile from junction.	R. bracteosum	*Very poor	-	Benedict, Miller, Root and Harris	9/20/29
Wilson Creek - both sides of Redwood Highway.	R. bracteosum	*Very poor	Many bushes north side of creek.	Benedict, Miller, Root and Harris.	9/20/29
Endert's Beach - west side of Redwood Highway.	R. bracteosum	*Very poor	Bushes near cottages.	Benedict, Miller, Root and Harris.	9/20/29
Junction of Mill Creek and Smith River. Enter through Mill Creek Grove of Big Trees.	R. sanguineum				
Mill Creek - where it crosses old highway.	R. bracteosum	*Very poor	Take old highway.	Root and Harris.	9/21/29
2 miles east of Gasquet along Highway towards Grants Pass, Oregon.	R. bracteosum	*Very poor	-	Root and Harris.	9/21/29
At several creeks along east side of Smith River. Road connects Crescent City-Grants Pass Highway and Crescent City-Smith River Highway.	R. sanguineum	#Good	Considerable sugar pine - 12-15 years old.	Root and Harris.	9/21/29
East side of Earle Lake - secondary road.	R. bracteosum	Very poor	-	Root and Harris.	9/22/29
Small creek tributary to Rowdy Creek 1 1/2 miles east of town of Smith River.	R. sanguineum R. menziesii R. divaricatum	Very poor	Bushes where road borders swamp.	Root and Harris.	9/22/29
On Gilbert Creek, northwest corner of county.	R. bracteosum	Very poor	-	Root and Harris.	9/22/29
*Pines 251 to 500 feet distant. #Pines over 1,500 feet distant.	R. bracteosum	Very poor	Excellent situation for rust to get hold.	Root and Harris.	9/23/29



INTERSECTION POINTS IN DET MOBILE COUNTY, CALIFORNIA

205



In addition to the inspection of Ribes, pines were carefully noted in a trip up Smith River as far as the Oregon line. Most of the pines were on the high ridges on both sides of the river. Just east of Gasquet, is a reproduction of sugar pines, 12 to 15 years of age, covering several acres. R. sanguineum is in the nearby vicinity but no R. bracteosum was found. This area deserves a more thorough study. Some planted 5-needled pines were set out near High Dome, in the northern part of the county in 1915 or 1916. Information obtained this year indicates that a large proportion had been killed by fire. This planting should be investigated in 1930.

The scouting was continued into southwestern Oregon, where infection was found in Curry County, a detailed report of which will be found in the Oregon annual report.

### RECOMMENDATIONS

Some plans for the future have been hinted at if not actually suggested in the foregoing report. The black currant eradication should be finished in 1930. At the end of the year this project should have reached the point where the state can be said to be completed. It may take the services of one scout beside the State Leader to accomplish this.

An intensive survey with the purpose of locating infections should be undertaken in the northern part of California, extending from Del Norte County across northern Siskiyou County and possibly Modoc County. Considerable time should be spent in the Smith River drainage in Del Norte County. Four men should be employed on this project.

Extensive scouting should be done throughout the state, especially in the sugar pine regions. A suggestion has been made that a careful study should be made where pinyon rust is encountered--the thought in mind that the blister rust might be found interrelated. This is worthy of consideration.

The time is approaching when the sanitation of forestry nurseries should be considered. There are several in the state owned by the Forest Service and private timber interests. The protection of certain experimental plots of the Forest Service should be given consideration, especially in the 5-needled pine regions.

It goes without saying that the chemical investigations should be continued as well as the ecological work. Some re-eradication should be done. This is being tentatively planned by the Spokane office.



In addition to the inspection of mines, pines were carefully noted in a trip up Smith River as far as the Oregon line. Most of the pines were on the high ridges on both sides of the river. These pines are a reproduction of sugar pines, 12 to 15 years of age, covering several acres. Pinus lambertiana is in the nearby vicinity but no H. bracteata was found. This area deserves a more thorough study. Some planted 3-needled pines were set out near High Dome, in the northern part of the county in 1913 or 1914. Information obtained this year indicates that a large proportion had been killed by fire. This planting should be investigated in 1927.

The scouting was continued into southwestern Oregon, where information was found in Curry County, a detailed report of which will be found in the Oregon annual report.

### RECOMMENDATIONS

Some pines for the future have been planted at it not recommended suggested in the foregoing report. The direct current eradication should be finished in 1926. At the end of the year this project should have reached the point where the state can be said to be completed. It will take the services of one scout beside the state lander to accomplish this.

An intensive survey with the purpose of forming information should be undertaken in the northern part of California, extending from Del Norte County across northern Placer County and possibly through County. Considerable time should be spent in the Smith River region in Del Norte County. Four men should be employed on this project.

Extensive scouting should be done throughout the state, especially in the sugar pine regions. A suggestion has been made that a careful study should be made more pines that is not interested--the thought in mind that the lister list might be found interested. This is worthy of consideration.

The time is approaching when the eradication of forestry nurseries should be considered. There are several in the state owned by the Forest Service and private timber interests. The eradication of certain experimental plots of the Forest Service should be given consideration, especially in the 3-needled pine regions.

It goes without saying that the chemical investigation should be continued as well as the ecological work. Some re-education should be done. This is being tentatively planned by the Bureau office.







The educational work should not be considered because of the completion of the black current eradication. It only needs to take a different aspect conforming to the other projects now under way as those contemplated for the future.

The food will and cooperation of the various species should be continued. This report would not be complete without an expression of appreciation to them for the help given in 1934.



# RIBES ECOLOGY ON THE STANISLAUS NATIONAL FOREST, CALIFORNIA,

1929

By

Frank A. Patty,  
Junior Pathologist.

## INTRODUCTION

The ecological studies were inaugurated in the sugar-pine region of California on the Stanislaus National Forest in 1928 and were continued during the summer of 1929 on this forest to obtain additional data and information on Ribes conditions as they exist in that region. This forest was selected because it contained a large area of consecutively cut-over lands as well as large stands of virgin timber where studies could be made. More recently fairly large areas have been cut over under the supervision of the United States Forest Service while adjacent areas have been completely denuded of all vegetation by private operators. This variety of existing conditions presented an excellent opportunity to make some interesting studies concerning Ribes regeneration.

The following quotation which was taken from a recent U. S. Forest Service pamphlet concerning this forest will give an idea of the importance of the Stanislaus National Forest. "As a timber producer the Stanislaus is one of the most important national forests in California. The estimated stand on Government land is  $9\frac{1}{2}$  million board feet. During 1927 more than 67 million board feet were cut, which brought a revenue to the U. S. Treasury of over \$231,859.00". Besides the Government lands, there are even larger holdings of privately-owned lands within the National Forest boundaries. It would probably be a conservative estimate to say that the holdings of the private companies amounted to 20 billion board feet on this forest. At the present rate of cutting, many thousands of acres of forest land will be opened up by cutting operations. After a stand of mature sugar pine has been opened up by cutting operations, the proper conditions apparently are created for the germination and establishment of a substantial Ribes flora on a large part of the area. These Ribes populations, through the agency of blister rust, will be a menace to seed trees and any seedlings of sugar pine which are later established.

The Stanislaus National Forest is located almost due east of San Francisco in about the central part of the Sierra Nevada range of mountains. Hence, ecological conditions may be considered as representative of the middle Sierran Range. Forests 200 miles north or 200 miles south of this forest probably will represent ecological conditions which are somewhat different than those of the Stanislaus. This forest contains the entire headwaters of the Stanislaus River, half of that of the Mokelumne and Tuolumne Rivers and a small part of that of the Merced River. The importance of the forest cover as a watershed cannot be over-



THE ECOLOGY OF THE STANISLAUS FOREST IN CALIFORNIA

1933

Dr.  
Frank M. Ratliff,  
Junior Paleontologist

INTRODUCTION

The ecological studies were inaugurated in the Stanislaus region of California on the Stanislaus National Forest in 1928 and were continued during the summer of 1933 on this forest to obtain additional data and information on riparian conditions as they exist in this region. This forest was selected because it contained a large area of comparatively low-over-land as well as large tracts of virgin timber where studies could be made. More recently, timber fires have been cut over under the supervision of the United States Forest Service while adjacent areas have been completely denuded of all vegetation by private operators. This variety of existing conditions presented an excellent opportunity to make some interesting studies concerning forest regeneration.

The following quotation which was taken from a recent report of the Forest Service pamphlet concerning this forest will give an idea of the importance of the Stanislaus National Forest. "As a timber producer, Stanislaus is one of the most important national forests in California. The estimated stand on Government land is 4 million to 4.5 million acres. During 1927 more than 67 million board feet were cut, which produced a revenue to the U. S. Treasury of over \$231,663.00. Besides the Government lands, there are even larger holdings of private forest land within the National Forest boundaries. It would probably be conservative estimate to say that the holdings of the private companies amounted to 20 million board feet on this forest. At the present rate of cutting, many thousands of acres of forest land will be opened up by cutting operations. After a stand of mature sugar pine has been opened up by cutting operations, the proper conditions apparently are created for the germination and establishment of a substantial riparian forest on a large part of the area. These riparian forests, through the agency of blower dust, will be a source to seed trees and sap seedlings of sugar pine which are later established.

The Stanislaus National Forest is located about the east of San Francisco in about the central part of the Sierra Nevada range. Hence, ecological conditions may be considered as representing five of the middle Sierran Range. Forests 200 miles north or 200 miles south of this forest probably will represent ecological conditions which are somewhat different than those of the Stanislaus. This forest contains the entire headwaters of the Stanislaus River, half of the Stanislaus River and a small part of the headwaters of the Mokelumne and Tuolumne Rivers and a watershed cannot be over-



emphasized because these rivers supply water for power, irrigation and human consumption in the valleys and cities of California.

The region of commercial sugar pine is found in a belt along the western slope of the Sierra Nevada Mountains in the Transitional Life Zone, and for conditions on this forest the altitudinal range of the sugar pine is between 3,000 and 6,500 feet in association with yellow pine, white fir, incense cedar and a small amount of Douglas fir. It is also found in the Canadian Life Zone from 6,500 to 7,500 feet (approximately) in association with Jeffrey pine and red fir. However, at present this region is not considered as one of much commercial importance by the logging companies because of the difficulties in logging and the fact that red fir, which often constitutes most of the stand, is considered an inferior species. It is in this Life Zone that *Ribes* may be found in abundance growing in the mature stands of timber, especially along the smaller streams or where the moisture table is close to the surface for a greater part of the growing season. *Ribes cereum*, *R. roezli*, *R. nevadense* and *R. viscosissimum* are the species which grow in such profusion in the Canadian Life Zone. When infection is well established in this region, these dense concentrations will probably aid a great deal in the intensification of the disease in the lower altitudes.

In the Transitional Life Zone or the present commercial belt of coniferous trees, sugar pine is found in association mainly with three other species. Generally speaking the sugar pine is found in association with white fir on the north and east exposures and with yellow pine and incense cedar on the warmer west and south exposures. A few groves of Big trees (*Sequoia gigantea*) may be found on this forest but they are only important from a botanical and scenic standpoint. Seemingly the Big trees occupy the optimum site for sugar pine on this forest because a good stand of large sugar pine is usually found in association with a grove of Big trees. Due to the enormous size of the Big trees, the presence and size of the sugar pines are seldom appreciated by anyone but a trained forester.

After a cutting, there is usually an appearance of an abundance of woody shrubs including *Ribes*. Some of the most important of these are the snow bush, the deer bush, wild rose, manzanita, bush chinquapin, the snowberry, bear clover, and *Ribes*. The bear clover frequently covers entire slopes in a very dense growth almost to the total exclusion of *Ribes*. Its creeping root stocks and thick resinous leaves make it quite resistant to drought. Bear clover is resistant to killing by fires, sprouting vigorously the year following a ground fire. A group of these plants was burned on May 20 and produced shoots 10 inches







long by September 15 the same year on a fairly dry site where Ribes were present. In places where the duff and brush are heavy enough to produce a hot burn, the root stocks of the bear clover are killed out and then the Ribes are able to establish themselves with the bear clover which must also come from seed. There is another plant on this forest which may be considered as somewhat detrimental to Ribes growth and this is the bush chinguapin. The dense foliage and the root growth of this species soon kills out most of its associates and as a result a few plants are found in association with it. Ribes are almost never found in association with this bush. The bush chinguapin is not found in such extensive areas as the bear clover so that it is not of much importance in the suppression of Ribes plants by natural or biological means. The two species with which Ribes are so often found in association are the snow bush and the manzanita. There is a temptation to call these two plants "the nursemaids of Ribes" because they are found so frequently growing with Ribes. The low spreading habit of the snow bush apparently creates an ideal situation for the germination and growth of *R. roezli*, or perhaps it is under the spreading limbs of this species that the chipmunk hides to eat Ribes fruits. In doing so he drops a few seeds. The manzanita with its thick leathery leaves whose margins are often perpendicular to the ground allows enough sunlight to reach the soil for the germination of Ribes seeds and their subsequent growth.

In general it is correct to state that wherever a stand of virgin timber is opened up by fire, the brush will come in to form a fairly dense stand, especially on the moist slopes. On the drier slopes there are many natural openings which are not completely filled in with brush but are more often bare or covered with the low-growing mats of bear clover.

#### PURPOSE

In general the purpose of the Ribes ecology project is to study the factors which control the germination, growth, dissemination and distribution of Ribes in the sugar-pine regions of California. With a knowledge of these factors, it may be possible to regulate one or more of them in order to aid in the suppression of Ribes in a stand of sugar pine by natural means. In places where suppression is dependent upon the removal of Ribes, these factors should be helpful in carrying out this work.

#### LOCATION AND DESCRIPTION OF AREAS

All of the work for the ecology project was performed on four major areas on the Stanislaus National Forest. The studies were conducted



from the September to the end of the year on a fairly high rate of growth were present. In places where the brush and brush were not so dense as in the other places, the root stocks of the bear clover were found to be able to establish themselves with the bear clover. There is another plant of this kind which may be considered as somewhat detrimental to the forest and this is the brush rhinoceros. The dense rhinoceros and the growth of this species soon kills out most of the associated plants. A few plants are found in association with it. Rhinoceros is never found in association with this plant. The brush rhinoceros is found in such extensive areas as the bear clover so that it is not of much importance in the suppression of other plants or animals on the forest margin. The two species with which Rhinoceros is often found in association are the snow plant and the muskrat. There is a temptation to call these two plants "the muskrat and the snow plant" but they are found so frequently growing with Rhinoceros. The low rate of growth of the snow plant creates an ideal situation for the germination of the seeds of *R. rosea*, or perhaps it is under the spreading leaves of this species that the chinquapin seeds do not fall. It does so because a few seeds. The muskrat with its thick leathery leaves whose margins are often perpendicular to the ground allows enough light to reach the soil for the germination of Rhinoceros seeds and their subsequent growth.

In general it is correct to state that wherever a stand of virgin timber is opened up by fire, the brush will come in to form a fairly dense stand, especially on the moist slopes. On the dry slopes there are many natural openings which are not completely filled in by brush but are more often bare or covered with the low-growing plants of the clover.

## DISCUSSION

In general the purpose of the Rhinoceros project is to study the factors which control the distribution, growth, dispersal, and the distribution of Rhinoceros in the sugar-bush regions of California. With a knowledge of these factors, it may be possible to regulate the growth of them in order to aid in the suppression of Rhinoceros in a stand of sugar pine by natural means. In places where suppression is dependent upon the removal of Rhinoceros, these factors should be helpful in carrying out this work.

## LOCATION AND DESCRIPTION OF STUDY

All of the work for the ecology project was performed on four sugar areas on the Stanislaus National Forest. The studies were conducted



on these areas in order that average conditions over the forest might be obtained. Large rivers or high ridges act as natural boundaries which separate the areas. Most of the cutting has been done on the south half of the forest, south of the middle fork of the Stanislaus River. The north half of the forest represents a large area of virgin timber which will be cut in the future.

#### A. The Strawberry Area.

The Strawberry area represents a large region which has been cut over under the supervision of the U. S. Forest Service during the last ten years. In addition there was left in this region a fair stand of virgin timber which was available for study. This area was also the scene of the hand eradication work in 1926 and 1927, and part of the experimental chemical eradication in 1927, 1928 and 1929. Several large permanent plots of the U. S. Forest Service were also available for Ribes regeneration studies. Because of the central location and accessibility, most of the permanent plots have been established here.

#### B. The Rosasco Area.

This area was substituted for the Mather area in 1929 because the latter was found to be very poorly stocked with sugar pine. Rosasco is reached by the narrow gauge railroad of the largest logging company operating on this forest. It is about fifty miles from Tuolumne, California to the present scene of operations of the company. Practically all of the land is privately owned and will be clear-cut. At present only the sugar pine and the yellow pine are cut. The white fir, incense cedar and Douglas fir are left standing or are knocked down in taking out the pine logs. The rolling hills are cut up by precipitous canyons of large and small streams. Many of the slopes of the canyons are so steep that they have not been logged, and the original stand remains surrounded by cut-over areas.

#### C. The Hazel Green Area.

This is another area in which most of the land is in the hands of logging companies. Hence, the residual stand of timber is almost negligible after logging. It is in this region that some of the best stocked stands of sugar pine may still be found. Yosemite National Park borders it on the east and the Merced River on the south.

#### D. The Dorrington Area.

The region about Dorrington is still a virgin stand of timber where poorly and well-stocked stands of sugar pine may be found. In 1928



on these areas in order that average conditions over the forest might be obtained. Large rivers or high ridges act as natural boundaries and separate the areas. Most of the cutting has been done on the west half of the forest, south of the middle fork of the Stanislaus River. The north half of the forest represents a large area of virgin timber which will be cut in the future.

#### A. The Strawberry Area.

The Strawberry area represents a large region which has been cut over under the supervision of the U. S. Forest Service during the last ten years. In addition there was left in this region a large stand of virgin timber which was available for study. This area was also the scene of the land reclamation work in 1928 and 1929, and was of the experimental chemical treatment in 1927, 1928 and 1929. Several large permanent plots of the U. S. Forest Service were also available for long term regeneration studies. Because of the central location and accessibility, most of the permanent plots have been established here.

#### B. The Rosasco Area.

This area was substituted for the Warner area in 1928 because the latter was found to be very poorly stocked with sugar pine. Rosasco is reached by the narrow gauge railroad of the Forest Logging Company operating on this forest. It is about fifteen miles from Independence, California to the present scene of operations of the company. Practically all of the land is privately owned and will be clear-cut. At present only two sugar pine and the yellow pine are cut. The white fir, incense cedar and Douglas fir are left standing or are skinned down in taking out the pine logs. The rolling hills are cut up by precipitous canyons of large and small streams. Many of the slopes of the canyons are so steep that they have not been logged, and the original stand remains surrounded by cut-over areas.

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#### D. The Dorrington Area.

The region about Dorrington is still a virgin stand of timber where poorly and well-stocked stands of sugar pine may be found. In 1929



the hand eradication forces performed their work here. A few studies were conducted to note the effect of the removal of Ribes in a virgin stand of timber. The Dorrington area is north of the North Fork of the Stanislaus River and on the northern end of the forest.

### METHODS USED IN MAKING STUDIES

The studies conducted during the field season of 1929 can be roughly divided into three groups: (1) permanent plots, (2) temporary plots or strip transects, (3) miscellaneous studies and observations.

#### A. The Strip Transect Studies.

The strip transect study was used this year instead of the temporary milacre-plot studies because it permitted the sampling of 20 times as much acreage in about the same period of time.

The purposes of this study were to determine how soon Ribes appear after a disturbance by logging, how long they continue to appear, and to note the factors which influence their regeneration.

1. Methods and areas selected. This study was conducted on all of the regions where cutting had been done - Hazel Green, Rosasco and Strawberry. Strips were run on a compass line through the cut-over and virgin areas, using a 2-chain topographic tape with a trailer. At intervals of 2 chains a transect 2 chains long and 13.2 feet wide was established. For convenience the transect was divided into two stations each of which was one chain long and 13.2 feet wide. In other words a plot 2 chains long and 13.2 feet wide was established along a compass line and data were taken for every other transect. The area of the plot represents 40 milacres or one-twenty-fifth of an acre. The transect strips were run at forty-chain intervals through a section so that a fairly representative area could be covered. It was necessary in many cases to run the strips at right angles to the streams to gain information on the conditions more comparable to the area. All of the Ribes in the transect were checked and recorded on the standard forms. This method of sampling the Ribes conditions of an area proved to be rapid. Checks which were made indicated that it was quite efficient and satisfactory for making gross studies of cut-over areas.

#### B. Permanent Plots.

The permanent plots which were established in the past summer are based on the ones which have been used in north Idaho to study Ribes conditions. Liberal modifications were necessary to suit the conditions of California. It has been necessary in most cases to protect the plots



The band eradication forces performed their work here. The studies were conducted to note the effect of the removal of the timber stand of timber. The Portington area is north of the Portington River and on the northern end of the forest.

## METHODS USED IN FIELD STUDIES

The studies conducted during the field season of 1932 and 1933 were divided into three groups: (1) Permanent Plots, (2) Temporary Plots or Strip Transects, (3) Miscellaneous Studies and Observations.

### A. The Strip Transect Studies

The strip transect study was used first for the purpose of determining the effect of the removal of the timber stand on the growth of the forest. The strip transect studies became important in the sampling of the forest as much as in the study of the forest.

The purpose of this study was to determine how soon the forest would recover after a disturbance by logging, how long it would take to recover, and to note the factors which influence their regeneration.

1. Methods and areas selected. The study was conducted on all of the forest where cutting had been done - Hazel Green, Korooro and the Portington area. The study was conducted along the cut-down strip transects. The study was conducted along the cut-down strip transects, using a 100 ft. in topographic tape with a 10 ft. interval. At intervals of a chain a transect 10 chains long and 10 ft. wide was established. For convenience the transect was divided into two sections each of which was one chain long and 10 ft. wide. In each section a plot 2 chains long and 10 ft. wide was established along a compass line and data were taken for every other transect. The transect strips were run at forty-chain intervals along a section of the plot representing 10 miles of cut-down forest. It was necessary to have a fairly representative area could be covered. It was necessary in many cases to run the strips at right angles to the stream to gain information on the conditions more comparable to the stream. The strips in the transect were checked and recorded on the stream. This method of sampling the forest conditions is a very good one to be rapid. Checks which were made indicated that it was quite efficient and satisfactory for making long studies of cut-down forest.

### B. Permanent Plots

The permanent plots which were established in the first year are based on the ones which have been used in other places to study forest conditions. The permanent plots were necessary to study the conditions of California. It has been necessary in most cases to study the forest





W. 854 Donkey logging on private lands. No attempt is made to save young or immature trees.



W.855 Checking the Ribes on the Cow Creek plot. Note the dense brush cover.







with barbed wire fences because the forest land is grazed and browsed heavily by cattle and horses.

In general, the reason for making plot studies is to attempt to correlate some of the factors which control or influence the germination of *Ribes* seed. With this sort of an arrangement it is possible to control certain factors to a fair degree, for example, a definite amount of shade can be given to a certain group of plots under given conditions and by means of checks the importance of shade can be determined. Each group of plots will be taken up separately and the purpose of each will be explained more in detail.

### C. Miscellaneous Studies and Observations

#### 1. Survival-plot studies.

a. Purpose of study. This study was begun for the purpose of following through a group of seedlings from year to year to note the number that survive and at what age the majority of them begin to bear fruit. The effect of removing seedlings and the subsequent disturbing of the ground each year will also be noted.

b. Methods used. An area containing six milacre plots was fenced to prevent trampling by stock. Four of the plots were mapped and the location of each seedling was determined. On the other two plots the seedlings were removed and the ground was stirred with a rake to a depth of about three or four inches. It is planned to record the number of seedlings that appear on these two plots each fall and then stir the soil. On the four plots which were not disturbed the following points will be studied: (1) the number of new seedlings that appear, (2) the increase of live stem, (3) the survival of the bushes, and (4) the year at which most of the bushes begin to fruit. The site occupied by this group of plots is an excellent one for *R. roezli* because each plot averages about seventy-five seedlings per plot. Germination was started during the summer of 1928. Many veteran bushes near by survived the logging operations which were completed in 1926.

c. Results obtained. No results will be noted until next year because this plot was established in the fall of 1929.

### THE COW CREEK PLOT

#### A. Purpose of Study

This study was begun in 1928 to note the number of *Ribes* that come back after an area has been cut over and to follow through these



with barbed wire fences because the forest land is owned and managed  
heavily by cattle and horses.

In general, the reason for the plot studies is to  
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the germination of these seeds. With this sort of an experiment it  
is possible to control certain factors to a large degree, but it is  
a definite amount of seeds can be given to a certain amount of plots  
under given conditions and by means of which the important factors  
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number that survive and at what age the majority of them begin to  
fruit. The effect of removing seedlings and the subsequent growth  
of the ground each year will also be noted.

b. Methods used. An area containing the plots was  
fenced to prevent trampling by stock. Four of the plots were marked  
by stakes and the location of each seedling was determined. On the other two plots  
the seedlings were removed and the ground was covered with a layer of  
depth of about three or four inches. It is planned to remove the seedlings  
of seedlings that mature on these two plots each fall and then study  
the growth of the four plots which were not disturbed the following year.  
The number of new seedlings that appear, (2) the increase of five years,  
(3) the survival of the bushes, and (4) the year at which most of the bushes begin to fruit. The first observation  
by this group of plots is an excellent one for a study because  
plot averages about seventy-five seedlings per plot. Information was  
gathered during the summer of 1932. Many veteran bushes were  
the logging operations which were completed in 1926.

c. Results obtained. No results will be noted until next year  
because this plot was established in the fall of 1932.

#### THE LOGGING PLOTS

#### 4. Purpose of study

This study was begun in 1928 to note the number of trees that  
come back after an area has been cut over and to follow through these



bushes from year to year to determine when they show signs of being shaded out; to determine what species of brush or trees are instrumental in shading out these Ribes.

#### B. Methods Used.

An area of ten acres at Cow Creek which was cut in 1923 and fenced in 1927 was selected as the best place to carry on this experiment. The fencing will eliminate damages by stock and tourists frequenting this region. All of the bushes were located in 1928 and their ages determined. Each bush was staked with a two-foot stake to make re-checking easy the following years. Ceanothus, bear clover and other forms of brush may be found covering about three-fourths of this entire plot; consequently within a few years shading out and root competition should be showing their effects on the growth of the Ribes plants. During the summer of 1929 the bushes were rechecked again and a number of new bushes were recorded as well as a number of old ones which had been missed the year before while checking. Due to the heavy brush cover it is not surprising that a number of bushes were missed on the first check.

#### C. Results Obtained.

Table No. 1 shows the results thus far obtained from this study. It is interesting to note that no bushes germinated and survived in 1923 and 1924 while in 1925 twenty-two new bushes were established. The year of 1926 shows the biggest increase and the subsequent three years a steady decline up to 1929. All of the seedlings which were checked in 1929 were found in the immediate vicinity of old bushes or near the base of stumps. During the 7-year period from 1923 to 1929 there has been an increase from 2.6 bushes per acre to 14.6 bushes per acre, or an increase of 485%. Three of the bushes which were established in 1926 were found dead apparently from too much competition by other species of brush, chiefly bear clover.



brushes from year to year to determine what species of brush are most abundant in a given year and those which are less abundant.

Methods Used.

In area of red pines at Cow Creek which was cut in 1927 and 1928 was selected as the best place to carry on this experiment. The fencing will eliminate damages by stock and to some extent fire. All of the brush was located in 1927 and their ages determined. Each brush was staked with a two-foot stake to mark its location. Careful records were kept of the growth of the brush during the summer of 1928 the brush was measured again and a number of new bushes were recorded as well as a number of old ones which had been missed the year before while checking. Due to the heavy brush cover it is not surprising that a number of bushes were missed on the first check.

C. Results Obtained.

Table No. 1 shows the results thus far obtained from this experiment. It is interesting to note that no bushes germinated and survived in 1927 and 1928 while in 1929 twenty-two new bushes were established. The year of 1928 was a low drought year and the subsequent three years a steady decline up to 1930. All of the seedlings which were checked in 1929 were found in the immediate vicinity of old bushes or near the base of stumps. During the 4-year period from 1927 to 1930 there has been an increase from 2.6 bushes per acre to 14.6 bushes per acre, or an increase of 460%. Three of the bushes which were established in 1928 were found and apparently from seed which came from the species of brush, oak, live oak, etc.



TABLE NO. 1.

FREQUENCY DISTRIBUTION OF RIBES BY SPECIES ON COY CREEK  
EXPERIMENTAL AREA.

Year of Germination and Age Class of Ribes	R. roezli		R. cereum		R. visco.		Ribes Per Acre
	Fruit- ing	Not Fruiting	Fruit- ing	Not Fruiting	Fruit- ing	Not Fruiting	
Present before logging	8	18					2.6
1925 <sup>a</sup> 4-year old	4	16		2			2.2
1926 3-year old		39				1	4.0
1927 2-year old		28					2.8
1928 1-year old		15					1.5
1929 seedlings		15					1.5
Total	12	131	0	2	0	1	14.6

GERMINATION PLOT STUDY NUMBER ONE

A. Purpose of Study.

This study was begun to note the effect of the depth of planting, types of soil disturbance, shading and rodents on the germination of seeds of R. roezli.

B. Methods Used.

An area was fenced containing twelve plots each of which was 9.3 feet square or two milacres in area. One tier of four plots was screened with fly screen and shaded; a second tier was screened and the third tier was left unprotected. The plots in row 1 had the duff removed and the soil cultivated to a depth of four inches. In row 2 the soil and the duff were spaded under and the ground was cultivated to a depth of four inches. In row 3 the plots were not disturbed and in row 4 the duff was removed and the soil was left undisturbed. Each plot was divided into four quadrants and in each quadrant fruits of R. roezli were



Year of Birth	Age	Sex	Height	Weight	Color	Complexion	Build	Occupation	Education	Religion	Marital Status	Number of Children	Year of Marriage	Year of Birth of Children
1900	20	M	5' 8"	150	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1905	15	F	5' 2"	110	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1910	10	M	5' 0"	100	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1915	5	F	4' 8"	90	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1920	0	M	4' 6"	80	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1925	5	F	4' 4"	70	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1930	10	M	4' 2"	60	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1935	15	F	4' 0"	50	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1940	20	M	3' 8"	40	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1945	25	F	3' 6"	30	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1950	30	M	3' 4"	20	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1955	35	F	3' 2"	10	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1960	40	M	3' 0"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1965	45	F	2' 8"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1970	50	M	2' 6"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1975	55	F	2' 4"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1980	60	M	2' 2"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1985	65	F	2' 0"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
1990	70	M	1' 8"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
1995	75	F	1' 6"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
2000	80	M	1' 4"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
2005	85	F	1' 2"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
2010	90	M	1' 0"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
2015	95	F	0' 8"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
2020	100	M	0' 6"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
2025	105	F	0' 4"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
2030	110	M	0' 2"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
2035	115	F	0' 0"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922
2040	120	M	0' 0"	0	Brown	Light	Medium	Farmer	High School	Methodist	Married	2	1918	1920, 1922
2045	125	F	0' 0"	0	Brown	Light	Medium	Homemaker	High School	Methodist	Married	2	1918	1920, 1922

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This study was designed to note the effect of the types of soil disturbance, shading and rodents on the germination of seeds of *A. rostrata*.

E. E. Schmitt

An area was fenced containing twelve 1/2 acre plots of which 10 were 1.5 feet square by two inches in thick. The first of four plots was accompanied with fly screens and baited; a second plot was baited and the third tier was left unprotected. The plots in row 1 and the fifth row and the soil cultivated to a depth of four inches. In row 2 the soil and the buff were spaced under and the ground was covered to a depth of four inches. In row 3 the plots were not treated and in row 4 the buff was removed and the soil was left unprotected. Each plot was divided into four quadrants and in each quadrant 1/2 lb. of soil was



GRAPH NO. 1

GERMINATION PLOT STUDY NO. 1

Unprotected 9.3'		N. Screened 9.3'		Shaded & Screened 9.3'					
Duff Re- moved	1" Deep	2" Deep	2'	1" Deep	2" Deep	2'	1" Deep	2" Deep	9.3'
	$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface	
Un- dis- turbed	1" Deep	2" Deep	2'	1" Deep	2" Deep		1" Deep	2" Deep	9.3'
	$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface	
W.	1" Deep	2" Deep	2'	1" Deep	2" Deep		1" Deep	2" Deep	E.
	$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface	
Duff and Soil Dis- turbed	1" Deep	2" Deep	2'	1" Deep	2" Deep		1" Deep	2" Deep	9.3'
	$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface	
Duff Re- moved Soil Dis- turbed	1" Deep	2" Deep	2'	1" Deep	2" Deep		1" Deep	2" Deep	9.3'
	$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface		$\frac{1}{2}$ " Deep	Surface	

S.

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planted as follows: on the surface of the soil, one-half inch deep, one inch deep and two inches below the surface of the soil.

### C. Results Obtained.

Two inspections of the plots after planting showed that 22 per cent of the fruits had been eaten in the unprotected strip. Many of the fruits which had been planted two inches below the surface of the soil had been dug up and the seed had been eaten. In almost every case it was possible to find the empty hull of the Ribes fruit near by.

## GERMINATION PLOT STUDY NUMBER TWO

### A. Purpose of Study.

This permanent plot was established to study the viability of the seeds for three different years; the effect of various soil disturbances; rodents; and the effect of shading on the germination of the seeds of R. roezli.

### B. Methods Used.

This plot was prepared similar to plot number one but the depth of planting was made uniform for the entire group. One quadrant in each plot was planted to seeds collected in 1927, one to seeds collected in 1928, one to seeds collected in 1929 and the fourth quadrant was left as a check. The location of this plot is a favorable one for Ribes germination as evidenced by the many seedlings which were growing in close proximity.

### C. Results Obtained.

Again the rodents were found digging up the planted fruits and eating the seeds. No check was made on the number of fruits eaten. However, it is believed that a greater percentage were taken from this plot than from study plot number one. It was noted that a number of fruits from the protected strips had been eaten, but this number was rather small.

## GERMINATION PLOT STUDIES NUMBERS THREE AND FOUR

### A. Purpose of Studies.

These plots which are similar to plots number one and two are placed on north and east exposures where apparently there is plenty of moisture available throughout the year. They were made for the purpose







of studying the effect of soil disturbance, shading, rodents and exposure on the germination of seedlings of *E. roezlii*.

# B. Methods Used.

Both plots were prepared exactly as plots number one and two with the exception that all of the quadrants were planted with fruits at a depth of one-half inch. These fruits were collected in 1928.

Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930
Soil - disturbed	1929	1930	1929	1930	1929	1930

Arthur Young, 1930  
F. A. Pelt



of reaching the surface of soil in the case of the  
exposure on the surface of the soil in the case of the

5. Exposure

Both plots were exposed to the sun and the wind  
and the temperature was about 70° F. The  
first of the plots of one-half inch. The second were exposed to the



GRAPH NO. 2

GERMINATION PLOT STUDY NO. 2

	Unprotected 9.3'		2'	Screened 9.3'		2'	Screened & Shaded 9.3'	
Horizontal Row Plots Spaded Without Remov- ing Duff	1927	1928		1927	1928		1927	1928
	1929	Check		1929	Check		1929	Check
Horizontal Row Duff Remov- ed Spaded	1927	1928		1927	1928		1927	1928
	1929	Check		1929	Check		1929	Check
Horizontal Row Duff Remov- ed	1927	1928		1927	1928		1927	1928
	1929	Check		1929	Check		1929	Check
Horizontal Row Undis- turbed	1927	1928		1927	1928		1927	1928
	1929	Check		1929	Check		1929	Check

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### C. Results Obtained.

The rodents were digging up the dried fruits and eating the seeds on the unprotected strip. It seems that after seeds have been planted for a period of about two weeks they are no longer molested by animals. This point was borne out for all the plots which have been mentioned so far.

### MOISTURE GERMINATION STUDY PLOT

#### A. Purpose of Study.

On some of the dry sites *Ribes* are not found in abundance. For the purpose of this study the following hypothesis has been assumed: *Ribes* seeds may be present in the soil, but many of them fail to germinate and survive on account of the extreme dryness during most of the summer. To determine the validity of this hypothesis, this study has been started on a dry exposure where no *Ribes* are present within a radius of four chains.

#### B. Methods of Study.

A set of twelve plots, each with an area of two milacres, was fenced. In row number 1 all of the duff was removed from the plots, and the ground was spaded to a depth of four or five inches. In row number 2 the soil and duff were spaded. Row number 3 was left as a check row with only the trees and large pieces of debris being removed. The set of plots is on a gentle south slope, and the two upper plots for each row were selected as the dry plots. A space ten feet wide was left between the upper plots in the three rows and the lower ones. A trench was dug through the space, and water from a near-by spring turned into it, giving the lower set of plots plenty of moisture. Fruits of *R. roezli* were planted under four conical wire screens on each plot. It is probable that these screens will afford a greater amount of protection from the rodents than the screened plots which were constructed on plots number one to four. This type of construction also has the advantage of being much cheaper than the other and takes much less time to establish. However, it is possible to use many more plantings with former plots.

### C. Results Obtained.

Examinations of the soil during the latter part of the summer showed that the lower set of plots was receiving sufficient moisture to make the soil fairly moist. This study was not started until after the middle of August. Consequently, no germinations were expected in



## C. Results obtained

The rodents were placed in the cages and the results of the experiment were as follows. It was found that the rodents were very active and that they were very much interested in the food. This was the first time that the rodents had been fed in this way. The results of the experiment were as follows.

## RESULTS OBTAINED

### A. Run test of activity

On some of the day active mice were placed in the cages for the purpose of this study the following results were obtained. The mice were very active and they were very much interested in the food. The results of the experiment were as follows. The mice were very active and they were very much interested in the food. The results of the experiment were as follows.

### B. Response to stimuli

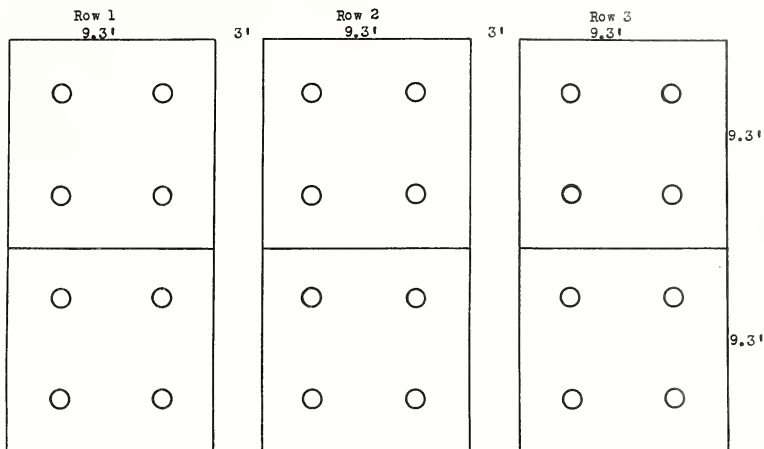
A set of twelve mice, each with an area of two square feet was fenced. In two weeks all of the mice were removed from the cages and the cages were divided into two groups. The mice were very active and they were very much interested in the food. The results of the experiment were as follows. The mice were very active and they were very much interested in the food. The results of the experiment were as follows.

### C. Results obtained

Examination of the soil during the first part of the experiment showed that the lower part of the soil was very much interested in the food. The results of the experiment were as follows. The mice were very active and they were very much interested in the food. The results of the experiment were as follows.



Graph No. 3.  
MOISTURE GERMINATION STUDY PLOT

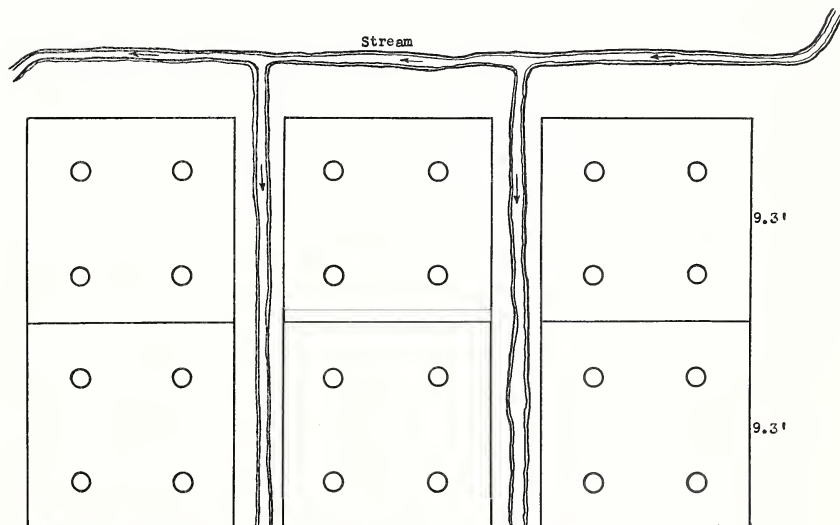


All Duff Removed and Ground Spaded in This Vertical Row

Ground Spaded Without Removing Duff in This Vertical Row

This Vertical Row of Plots Undisturbed

10'



NOTE: ○ marks conical screens under which fruits were planted.

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1929. The soil was powder dry to a depth of about four feet in early August on the plots which were not irrigated.

## RIBES GERMINATION STUDY BY EXPOSURE AFTER LOGGING

### A. Purpose of Study.

This study was begun in 1928 to determine whether there were any differences in the germination of Ribes over a period of years on the north, south, east and west exposures following logging.

### B. Methods Used.

The plots were laid out on north, south, east and west exposures in 1928 and rechecked again during 1929. Four plots were placed at equal distances from streams for each exposure, making a total of sixteen plots in all. The first set of plots for each exposure was established approximately six chains from a stream; the second set an additional six chains; the third six chains more; and the last set another six chains, making the final set twenty-four chains from the stream. This method was used to avoid having all the plots for one exposure on a contour instead of being at right angles to the stream. Hence, fairly comparable conditions were probably secured with respect to moisture on each slope.

### C. Results Obtained.

From the table there appears to be a fair germination of Ribes on the north and east exposures for a period of five years after a cutting. On the other hand, germination seems to be on a decline for the other two exposures at the end of the five-year period. Further analysis of this table shows that there was no germination during the first year of logging--at least there was no survival.







TABLE NO. 2.

RIBES GERMINATION BY EXPOSURE FOLLOWING LOGGING

Exposure	Number Present Before Logging	Number of Ribes Per Acre Germinating Each Year					Total Ribes Per Acre for 5 Years
		1925	1926	1927	1928	1929	
North	6		19	87	88	96	290
East	2		20	23	40	24	107
West	4		1	16	25	5	47
South	1		4	10	7	3	24
Total Ribes per acre germinating each year		0	44	136	160	128	

Note: The area on which this study was made was cut in 1925.

ROOT AND CROWN STUDIES OF R. ROEZLIA. Purpose of Study.

This study was started to determine the regeneration of R. roezli caused by (1) the removal of the crown, and (2) leaving the crown in the ground. Another purpose of this plot was to make a study of the seedlings that come in after a bush has been removed.

B. Methods Used.

Four bushes which were grouped together were treated in the following manner: (1) the branches were cut off and the crown left exposed; (2) the branches were cut off and the crown was covered with four inches of soil; (3) the branches and crown were cut off and roots left exposed; (4) the crown and branches were removed and the remaining roots were covered with four inches of dirt. Notations were made on any seedlings found near the bushes. All of the bushes were old and were bearing a small crop of fruit.

C. Results Obtained.

The plots were established in the fall, and no results were obtained to date. Twenty-eight groups of bushes with four bushes in each



ANALYSIS OF THE DATA

Number of cases				Number of cases			
Present				Previous			
Total				Total			
1957-1958				1956-1957			
North	12	27	39	10	24	34	44
West	10	23	33	8	21	29	37
East	1	16	17	1	15	16	21
South	1	10	11	1	10	11	12
Total				Total			
34				44			

Note: The cases in which the data was not available.

ANALYSIS OF THE DATA

1. Results of the study

The study was designed to determine the relationship of the following factors to the occurrence of the disease: (1) the presence of the disease in the family, (2) the presence of the disease in the community, (3) the presence of the disease in the environment, (4) the presence of the disease in the individual.

2. Results of the study

The study was designed to determine the relationship of the following factors to the occurrence of the disease: (1) the presence of the disease in the family, (2) the presence of the disease in the community, (3) the presence of the disease in the environment, (4) the presence of the disease in the individual.

3. Results of the study

The study was designed to determine the relationship of the following factors to the occurrence of the disease: (1) the presence of the disease in the family, (2) the presence of the disease in the community, (3) the presence of the disease in the environment, (4) the presence of the disease in the individual.



group were treated as described above. This made a total of one hundred and twelve plants in the study.

#### THE NEEDLE RETENTION STUDY FOR SUGAR PINE

##### A. Purpose of Study.

This study was made to obtain some data on the number of years sugar pine holds its needles. The study was confined to young sugar pine trees ten feet or less in height.

##### B. Methods Used.

The terminal and three of the upper terminal laterals were used for each tree representing four specimens per tree. About an equal number of trees for the four major exposures were selected and needles counted for four branches on each tree.

##### C. Results Obtained

From these data it appears that sugar pine retains about 22 per cent of its needles in the fifth year, and after that time only a very small number remains on the branches. Too much emphasis must not be placed on this table because many factors such as suppression, age of tree, moisture conditions, and age of stand have not been considered. Some difference in the time the trees hold their needles would probably be found if reproduction in a mature stand and cut-over stand were studied separately.



Group were treated as follows above  
and their findings in the study.

1500 to 2000 ft.

These three can lead to death in a split  
second time if the need arises. The work was continued in the morning.

.. 2500 ..

594100 21225

1. The first of these is the fact that the number of members of the House of Representatives is fixed by the Constitution at 435. This number is divided among the States on the basis of population. The number of members of the House of Representatives from each State is determined by the number of members of the House of Representatives from each State in the previous Congress. The number of members of the House of Representatives from each State is determined by the number of members of the House of Representatives from each State in the previous Congress. The number of members of the House of Representatives from each State is determined by the number of members of the House of Representatives from each State in the previous Congress.



GRAPH NO. 4

NEEDLE RETENTION STUDY FOR SUGAR PINE

Number of Years Needles are Re- tained	Number of Specimens				Per Cent of Specimens Retaining Needles
	50	100	150	200	
0				250	300
2	(76)				10.7
3	(167)				23.4
4	(291)				41.0
5	(160)				22.4
6	(8)				1.1
7	(7)				1.0
8	(3)				0.4

NOTE: Figures in parenthesis represent number of specimens holding needles for each year.

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## THE INFLUENCE OF OLD BUSHES ON SEEDLING REPRODUCTION

### A. Purpose of Study.

This study was started to note the number of Ribes seedlings that appear on plots where bushes were present and where bushes were absent.

### B. Method Used.

Plots were established on an equal number of areas where bushes had been removed and a definite amount of soil disturbance had been created. Check plots were laid out where no bushes had been growing but where similar soil disturbances had been caused. In order to obtain conditions that were as nearly comparable as possible, the plots were placed fairly close together. A check was made of these plots one year after the removal of the bushes to ascertain how many seedlings had appeared.

### C. Results Obtained.

The following table shows the results of this study one year after the removal of the bushes. In all cases but one there appears to be a decided influence of the old bushes on the number of seedlings that appear. The reason for plot number two failing to produce any seedlings is not known because conditions were quite favorable for germination and survival of seedlings. The plots without bushes on them were placed in the immediate vicinity of the corresponding plots. For example, plot number one was one-half chain from plot number 1-A, plot number two was about a chain from plot number 2-A, etc. It is probable that the plots which produced only a very few bushes per acre received seed from the plots which produced a great many bushes to the acre. There is no doubt a relation of Ribes reproduction to the presence or absence of old bushes. This would point to the fact that seed is probably not stored in the soil in large quantities in this region.



THE REMOVAL OF OLD BUSHES TO A NEW SITE

1. Purpose of Study

This study was carried out with the purpose of determining the effect of the removal of old bushes on the growth of new bushes.

2. Method Used

Plots were established on an area of 100 ft. by 100 ft. and were divided into four groups. Group A was the control group and consisted of 10 plots. Group B consisted of 10 plots and was the group in which the old bushes were removed. Group C consisted of 10 plots and was the group in which the old bushes were removed and the new bushes were planted. Group D consisted of 10 plots and was the group in which the old bushes were removed and the new bushes were planted and the old bushes were replaced.

3. Results Obtained

The following table shows the results of the study. It will be seen that the removal of the old bushes had a marked effect on the growth of the new bushes. The reason for this is not known but it is possible that the removal of the old bushes had a marked effect on the growth of the new bushes. The results of the study are as follows:

Group	Number of Plots	Height of Bushes (ft.)	Number of New Bushes
A	10	1.5	10
B	10	2.5	10
C	10	3.5	10
D	10	4.5	10



TABLE NO. 3.

INFLUENCE OF OLD BUSHES ON SEEDLING PRODUCTION  
AFTER BUSHES ARE REMOVED.

	Ribes Per Acre					
	Plot No. 1	Plot No. 2	Plot No. 3	Plot No. 4	Plot No. 5	Plot No. 6
Plots with bushes removed	33	0	25	17	38	5
	Plot No. 1A	Plot No. 2A	Plot No. 3A	Plot No. 4A	Plot No. 5A	Plot No. 6A
Plot without bushes (comparable soil disturbance)	0	0	2	1	1	1

RIBES GERMINATION STUDIES FOLLOWING LOGGING

A. Purpose of Study.

This work was begun to determine how long after a cutting it would be before Ribes would begin to appear and the number of years they continue to germinate on logged-over land.

B. Method Used.

The methods used have been discussed previously under the heading of "Temporary Plots" or "Strip Transect Study".

C. Results Obtained.

The results which were obtained from this study are found in Table No. 4. A summary of the more important points in this table may be listed as follows:-

1. The percentage of Ribes germinating during the year of logging is very small.
2. The year following logging there is a fair germination.
3. During the third and fourth years a still greater increase is noticeable.
4. Ten and eleven years following logging a fair percentage of Ribes seed germinate and thus increase the Ribes flora.



Plot with bushes removed	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12	Plot 13	Plot 14	Plot 15	Plot 16	Plot 17	Plot 18	Plot 19	Plot 20	Plot 21	Plot 22	Plot 23	Plot 24	Plot 25	Plot 26	Plot 27	Plot 28	Plot 29	Plot 30	Plot 31	Plot 32	Plot 33	Plot 34	Plot 35	Plot 36	Plot 37	Plot 38	Plot 39	Plot 40	Plot 41	Plot 42	Plot 43	Plot 44	Plot 45	Plot 46	Plot 47	Plot 48	Plot 49	Plot 50	Plot 51	Plot 52	Plot 53	Plot 54	Plot 55	Plot 56	Plot 57	Plot 58	Plot 59	Plot 60	Plot 61	Plot 62	Plot 63	Plot 64	Plot 65	Plot 66	Plot 67	Plot 68	Plot 69	Plot 70	Plot 71	Plot 72	Plot 73	Plot 74	Plot 75	Plot 76	Plot 77	Plot 78	Plot 79	Plot 80	Plot 81	Plot 82	Plot 83	Plot 84	Plot 85	Plot 86	Plot 87	Plot 88	Plot 89	Plot 90	Plot 91	Plot 92	Plot 93	Plot 94	Plot 95	Plot 96	Plot 97	Plot 98	Plot 99	Plot 100	Plot 101	Plot 102	Plot 103	Plot 104	Plot 105	Plot 106	Plot 107	Plot 108	Plot 109	Plot 110	Plot 111	Plot 112	Plot 113	Plot 114	Plot 115	Plot 116	Plot 117	Plot 118	Plot 119	Plot 120	Plot 121	Plot 122	Plot 123	Plot 124	Plot 125	Plot 126	Plot 127	Plot 128	Plot 129	Plot 130	Plot 131	Plot 132	Plot 133	Plot 134	Plot 135	Plot 136	Plot 137	Plot 138	Plot 139	Plot 140	Plot 141	Plot 142	Plot 143	Plot 144	Plot 145	Plot 146	Plot 147	Plot 148	Plot 149	Plot 150	Plot 151	Plot 152	Plot 153	Plot 154	Plot 155	Plot 156	Plot 157	Plot 158	Plot 159	Plot 160	Plot 161	Plot 162	Plot 163	Plot 164	Plot 165	Plot 166	Plot 167	Plot 168	Plot 169	Plot 170	Plot 171	Plot 172	Plot 173	Plot 174	Plot 175	Plot 176	Plot 177	Plot 178	Plot 179	Plot 180	Plot 181	Plot 182	Plot 183	Plot 184	Plot 185	Plot 186	Plot 187	Plot 188	Plot 189	Plot 190	Plot 191	Plot 192	Plot 193	Plot 194	Plot 195	Plot 196	Plot 197	Plot 198	Plot 199	Plot 200	Plot 201	Plot 202	Plot 203	Plot 204	Plot 205	Plot 206	Plot 207	Plot 208	Plot 209	Plot 210	Plot 211	Plot 212	Plot 213	Plot 214	Plot 215	Plot 216	Plot 217	Plot 218	Plot 219	Plot 220	Plot 221	Plot 222	Plot 223	Plot 224	Plot 225	Plot 226	Plot 227	Plot 228	Plot 229	Plot 230	Plot 231	Plot 232	Plot 233	Plot 234	Plot 235	Plot 236	Plot 237	Plot 238	Plot 239	Plot 240	Plot 241	Plot 242	Plot 243	Plot 244	Plot 245	Plot 246	Plot 247	Plot 248	Plot 249	Plot 250	Plot 251	Plot 252	Plot 253	Plot 254	Plot 255	Plot 256	Plot 257	Plot 258	Plot 259	Plot 260	Plot 261	Plot 262	Plot 263	Plot 264	Plot 265	Plot 266	Plot 267	Plot 268	Plot 269	Plot 270	Plot 271	Plot 272	Plot 273	Plot 274	Plot 275	Plot 276	Plot 277	Plot 278	Plot 279	Plot 280	Plot 281	Plot 282	Plot 283	Plot 284	Plot 285	Plot 286	Plot 287	Plot 288	Plot 289	Plot 290	Plot 291	Plot 292	Plot 293	Plot 294	Plot 295	Plot 296	Plot 297	Plot 298	Plot 299	Plot 300	Plot 301	Plot 302	Plot 303	Plot 304	Plot 305	Plot 306	Plot 307	Plot 308	Plot 309	Plot 310	Plot 311	Plot 312	Plot 313	Plot 314	Plot 315	Plot 316	Plot 317	Plot 318	Plot 319	Plot 320	Plot 321	Plot 322	Plot 323	Plot 324	Plot 325	Plot 326	Plot 327	Plot 328	Plot 329	Plot 330	Plot 331	Plot 332	Plot 333	Plot 334	Plot 335	Plot 336	Plot 337	Plot 338	Plot 339	Plot 340	Plot 341	Plot 342	Plot 343	Plot 344	Plot 345	Plot 346	Plot 347	Plot 348	Plot 349	Plot 350	Plot 351	Plot 352	Plot 353	Plot 354	Plot 355	Plot 356	Plot 357	Plot 358	Plot 359	Plot 360	Plot 361	Plot 362	Plot 363	Plot 364	Plot 365	Plot 366	Plot 367	Plot 368	Plot 369	Plot 370	Plot 371	Plot 372	Plot 373	Plot 374	Plot 375	Plot 376	Plot 377	Plot 378	Plot 379	Plot 380	Plot 381	Plot 382	Plot 383	Plot 384	Plot 385	Plot 386	Plot 387	Plot 388	Plot 389	Plot 390	Plot 391	Plot 392	Plot 393	Plot 394	Plot 395	Plot 396	Plot 397	Plot 398	Plot 399	Plot 400	Plot 401	Plot 402	Plot 403	Plot 404	Plot 405	Plot 406	Plot 407	Plot 408	Plot 409	Plot 410	Plot 411	Plot 412	Plot 413	Plot 414	Plot 415	Plot 416	Plot 417	Plot 418	Plot 419	Plot 420	Plot 421	Plot 422	Plot 423	Plot 424	Plot 425	Plot 426	Plot 427	Plot 428	Plot 429	Plot 430	Plot 431	Plot 432	Plot 433	Plot 434	Plot 435	Plot 436	Plot 437	Plot 438	Plot 439	Plot 440	Plot 441	Plot 442	Plot 443	Plot 444	Plot 445	Plot 446	Plot 447	Plot 448	Plot 449	Plot 450	Plot 451	Plot 452	Plot 453	Plot 454	Plot 455	Plot 456	Plot 457	Plot 458	Plot 459	Plot 460	Plot 461	Plot 462	Plot 463	Plot 464	Plot 465	Plot 466	Plot 467	Plot 468	Plot 469	Plot 470	Plot 471	Plot 472	Plot 473	Plot 474	Plot 475	Plot 476	Plot 477	Plot 478	Plot 479	Plot 480	Plot 481	Plot 482	Plot 483	Plot 484	Plot 485	Plot 486	Plot 487	Plot 488	Plot 489	Plot 490	Plot 491	Plot 492	Plot 493	Plot 494	Plot 495	Plot 496	Plot 497	Plot 498	Plot 499	Plot 500	Plot 501	Plot 502	Plot 503	Plot 504	Plot 505	Plot 506	Plot 507	Plot 508	Plot 509	Plot 510	Plot 511	Plot 512	Plot 513	Plot 514	Plot 515	Plot 516	Plot 517	Plot 518	Plot 519	Plot 520	Plot 521	Plot 522	Plot 523	Plot 524	Plot 525	Plot 526	Plot 527	Plot 528	Plot 529	Plot 530	Plot 531	Plot 532	Plot 533	Plot 534	Plot 535	Plot 536	Plot 537	Plot 538	Plot 539	Plot 540	Plot 541	Plot 542	Plot 543	Plot 544	Plot 545	Plot 546	Plot 547	Plot 548	Plot 549	Plot 550	Plot 551	Plot 552	Plot 553	Plot 554	Plot 555	Plot 556	Plot 557	Plot 558	Plot 559	Plot 560	Plot 561	Plot 562	Plot 563	Plot 564	Plot 565	Plot 566	Plot 567	Plot 568	Plot 569	Plot 570	Plot 571	Plot 572	Plot 573	Plot 574	Plot 575	Plot 576	Plot 577	Plot 578	Plot 579	Plot 580	Plot 581	Plot 582	Plot 583	Plot 584	Plot 585	Plot 586	Plot 587	Plot 588	Plot 589	Plot 590	Plot 591	Plot 592	Plot 593	Plot 594	Plot 595	Plot 596	Plot 597	Plot 598	Plot 599	Plot 600	Plot 601	Plot 602	Plot 603	Plot 604	Plot 605	Plot 606	Plot 607	Plot 608	Plot 609	Plot 610	Plot 611	Plot 612	Plot 613	Plot 614	Plot 615	Plot 616	Plot 617	Plot 618	Plot 619	Plot 620	Plot 621	Plot 622	Plot 623	Plot 624	Plot 625	Plot 626	Plot 627	Plot 628	Plot 629	Plot 630	Plot 631	Plot 632	Plot 633	Plot 634	Plot 635	Plot 636	Plot 637	Plot 638	Plot 639	Plot 640	Plot 641	Plot 642	Plot 643	Plot 644	Plot 645	Plot 646	Plot 647	Plot 648	Plot 649	Plot 650	Plot 651	Plot 652	Plot 653	Plot 654	Plot 655	Plot 656	Plot 657	Plot 658	Plot 659	Plot 660	Plot 661	Plot 662	Plot 663	Plot 664	Plot 665	Plot 666	Plot 667	Plot 668	Plot 669	Plot 670	Plot 671	Plot 672	Plot 673	Plot 674	Plot 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786	Plot 787	Plot 788	Plot 789	Plot 790	Plot 791	Plot 792	Plot 793	Plot 794	Plot 795	Plot 796	Plot 797	Plot 798	Plot 799	Plot 800	Plot 801	Plot 802	Plot 803	Plot 804	Plot 805	Plot 806	Plot 807	Plot 808	Plot 809	Plot 810	Plot 811	Plot 812	Plot 813	Plot 814	Plot 815	Plot 816	Plot 817	Plot 818	Plot 819	Plot 820	Plot 821	Plot 822	Plot 823	Plot 824	Plot 825	Plot 826	Plot 827	Plot 828	Plot 829	Plot 830	Plot 831	Plot 832	Plot 833	Plot 834	Plot 835	Plot 836	Plot 837	Plot 838	Plot 839	Plot 840	Plot 841	Plot 842	Plot 843	Plot 844	Plot 845	Plot 846	Plot 847	Plot 848	Plot 849	Plot 850	Plot 851	Plot 852	Plot 853	Plot 854	Plot 855	Plot 856	Plot 857	Plot 858	Plot 859	Plot 860	Plot 861	Plot 862	Plot 863	Plot 864	Plot 865	Plot 866	Plot 867	Plot 868	Plot 869	Plot 870	Plot 871	Plot 872	Plot 873	Plot 874	Plot 875	Plot 876	Plot 877	Plot 878	Plot 879	Plot 880	Plot 881	Plot 882	Plot 883	Plot 884	Plot 885	Plot 886	Plot 887	Plot 888	Plot 889	Plot 890	Plot 891	Plot 892	Plot 893	Plot 894	Plot 895	Plot 896	Plot 897	Plot 898	Plot 899	Plot 900	Plot 901	Plot 902	Plot 903	Plot 904	Plot 905	Plot 906	Plot 907	Plot 908	Plot 909	Plot 910	Plot 911	Plot 912	Plot 913	Plot 914	Plot 915	Plot 916	Plot 917	Plot 918	Plot 919	Plot 920	Plot 921	Plot 922	Plot 923	Plot 924	Plot 925	Plot 926	Plot 927	Plot 928	Plot 929	Plot 930	Plot 931	Plot 932	Plot 933	Plot 934	Plot 935	Plot 936	Plot 937	Plot 938	Plot 939	Plot 940	Plot 941	Plot 942	Plot 943	Plot 944	Plot 945	Plot 946	Plot 947	Plot 948	Plot 949	Plot 950	Plot 951	Plot 952	Plot 953	Plot 954	Plot 955	Plot 956	Plot 957	Plot 958	Plot 959	Plot 960	Plot 961	Plot 962	Plot 963	Plot 964	Plot 965	Plot 966	Plot 967	Plot 968	Plot 969	Plot 970	Plot 971	Plot 972	Plot 973	Plot 974	Plot 975	Plot 976	Plot 977	Plot 978	Plot 979	Plot 980	Plot 981	Plot 982	Plot 983	Plot 984	Plot 985	Plot 986	Plot 987	Plot 988	Plot 989	Plot 990	Plot 991	Plot 992	Plot 993	Plot 994	Plot 995	Plot 996	Plot 997	Plot 998	Plot 999	Plot 1000
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7-10-68

...to support...

They continue to believe no attack on Iraq ever took place before they would begin to appear at the court of law. This will be begun to determine how long after a military

Method Used.

...at the ...

The results which were obtained from the test are as follows:

A summary of the experimental work done by the author is given in the following table:



TABLE NO. 4.

## PERCENTAGE OF RIBES GERMINATING YEAR BY YEAR FOLLOWING LOGGING

Year of Log- ging	Tim- ber Types	Year of Germination																								Total	
		1928		1927		1926		1925		1924		1923		1922		1921											
		R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.	R. roez. nev.							
1928	SP-F	100.0	100.0																							100	100
	SP-YF	100.0	-																							100	-
1927	SP-F	94.7	98.6	5.3	1.4																					100	100
	SP-YF	40.0	-	60.0	-																					100	-
1926	SP-F	46.7	63.0	42.9	32.3	10.3	4.7	0.1																		100	100
	SP-YF	59.7	73.1	27.8	23.1	12.5	3.8																			100	100
1925	SP-F	41.5	41.4	41.6	43.7	15.4	13.7	1.5	1.2																	100	100
	SP-YF	18.3	100.0	47.0	-	28.7	-	6.0	-																	100	100
1924	SP-F	18.8	31.0	35.9	41.4	25.8	24.1	13.2	3.5	6.3																100	100
	SP-YF	35.4	20.0	27.7	20.0	24.6	20.0	12.3	40.0																	100	100
1923	SP-F	15.0	-	25.0	50.0	30.0	50.0	25.0	-	5.0																100	100
1921	SP-F	10.2	-	8.8	3.6	14.3	67.8	27.0	21.4	38.3	3.6	1.4	3.6													100	100
	SP-YF	6.1	16.2	16.2	32.4	32.4		36.8		8.5																100	-
1920	SP-F	9.2	21.4	21.4		17.4	9.0	22.4	45.5	19.4	45.5	3.4														100	100
	SP-YF	12.5	40.0	40.0		17.5		25.0		5.0																100	-
1918	SP-F	12.9		12.9		9.7		25.8		22.6		9.7														100	-
	SP-YF			9.1		18.2		45.6		15.2		9.1														100	-



EVANS, W. J.

RECAPITULATE OF VTS. GETTING THE BA AND BOTTOMING TOWING



## GENERAL STUDIES AND OBSERVATIONS

A number of general studies were started, and they will be only briefly mentioned in this report. There are also a number of studies which were started in 1928 but so far have not had sufficient time to yield any significant data.

1. A twenty-acre experimental plot was logged on a selective basis. Eighteen years later all of the mature trees were removed. A minimum amount of disturbance was caused to the ground and ground cover by the last cutting. This plot is to be followed through from year to year to check the *Ribes* regeneration. The entire plot is covered with a fair stand of reproduction and a fair amount of brush. This is one of the original study plots of the U. S. Forest Service, which has been under surveillance for many years.

2. A five-acre plot of sugar pine-fir type, was carefully gone over, and all of the *Ribes* were removed. An adjacent plot of five acres was laid out near by, and the number of feet of live stem and *Ribes* were recorded. These plots are to be studied to note the effects of removing *Ribes* before and after a cutting with the idea in mind of determining the source of seed which produces *Ribes* after logging.

3. Two five-acre plots in the sugar pine-yellow pine type were also established and treated in the same manner as the plots under number two. The purpose of these plot studies is the same as that outlined in study 2 above. The trees on all of these plots were felled about two weeks after the data had been taken on them.

4. Four hundred *Ribes* fruits were planted four inches apart in rows. Two days after planting an examination was made and 29 per cent of the fruits had disappeared. A second examination five days later revealed that 35 per cent of the total number had been eaten. In most all cases the empty hulls of the fruits were found near by. The study was interrupted by a herd of cattle which spent the afternoon on this study plot.

5. Two bushes having a total of 438 fruits were placed near camp where observations could be made. In four days all of the fruits had been eaten or carried away by two chipmunks.

6. A box with ten compartments was built, screened, and placed in the ground. In each compartment 200 fruits of *R. roezli* were placed. The box was then covered with a few inches of soil and duff. It is planned to remove 200 fruits from one of the compartments each year and test



# GENERAL PRINCIPLES OF RESEARCH

A number of general studies were started, and only a few of them are mentioned in this report. There are also a number of studies which were started in 1933 but have not yet been completed. These studies are of great importance.

1. A twenty-acre experimental plot was located on a hillside. In 1933, a number of the mature trees were removed. The amount of disturbance was caused to the ground and around cover to be followed through the year to see the effect of the disturbance. The entire plot is covered with a thin stand of reproduction and a fair amount of brush. This is one of the original study plots of the U. S. Forest Service, which has been under surveillance for many years.

2. A five-acre plot of sugar pine-typic type, was carefully examined, and all of the trees were removed. In 1933, a number of the trees were laid out near by, and the number of feet of live trees were recorded. These plots are to be studied to note the effect of removing trees before and after a cutting with the idea of determining the source of seed which produced trees after logging.

3. Two five-acre plots in the sugar pine-yellow pine type forest also established and treated in the same manner as the plots under study. The purpose of these plots is the same as those under study 2 above. The trees on all of these plots were laid out about two weeks after the data had been taken on them.

4. Four hundred trees were planted four years ago in two rows. Two days after planting, an examination was made and 25 percent of the trees had disappeared. A second examination five days later revealed that 35 percent of the total number had been eaten. It was all cases the empty holes of the trees were found near by, and it was interrupted by a herd of cattle which went the afternoon of the study plot.

5. Two ranges having a total of 488 trees were of great value where observations could be made. In four days all of the trees had been eaten or carried away by two chimpanzees.

6. A box with ten compartments was built, scattered, and placed in the ground. In each compartment 500 fruits of *A. rosea* were placed. The box was then covered with a few inches of soil and left to remove 200 fruits from one of the compartments each year and test



them in the laboratory each winter by the method worked out at the Boyce Thompson Institute.

7. During the latter part of the summer many examinations were made of R. roezli and R. nevadense for rusts. At Strawberry it was possible to find Cronartium occidentale on R. roezli wherever the latter was in exposed locations. The infection on R. roezli was very heavy in many cases. Careful examinations of R. nevadense failed to show even a single infection on bushes that were growing in close association with heavily infected R. roezli bushes.

8. No attempt was made to study the year at which Ribes begin to fruit because of the heavy frost which upset normal fruiting conditions.

9. A recheck of the burned brush piles and a study of additional piles gave the same results as last year. The brush pile burns do not have any marked effect upon the Ribes stand in the immediate vicinity. Ribes were found growing around the edge of the piles but not in the center or in the hot part of the burns. In no case was there any reproduction of Ribes in large numbers around the edges. Usually where bushes were found near the edge of the burn, they were found in equal abundance within a radius of twenty-five to thirty feet of the burn. Conversely, where no bushes were found near the edge of the burn there were none within a radius of from twenty-five to thirty feet around it. Thus, it is possible to state that the brush pile burns influence Ribes germination very little if any at all. If conditions are favorable for germination, there will be Ribes produced as long as the soil disturbance has been caused.

10. A set of thirty-six milacre plots was established last year. Various soil disturbances were applied, and fruits were planted. (The detailed description of this plot may be found in the 1928 Annual Report.) None of the planted fruits germinated in 1929. However, two volunteers appeared on one of the shaded plots. This plot is on a rather dry exposure, and a few old Ribes bushes may be found three chains north of it.

11. During the season, new plants which were encountered were collected and identified. It is planned to have a collection of all of the plants that are found in association with Ribes. At present there is no immediate need for such a collection of plants, but future plans may call for a knowledge of these plants. This list now has the names of about one hundred and twenty plants in it.

12. Collections were made of R. roezli leaves for further study on the leaf-area and live-stem ratios. No collections have been made of the



then in the laboratory each winter in the laboratory of the  
Joyce-Thompson Institute.

7. During the latter part of the summer and early autumn years of  
1911 and 1912, the following were collected: H. roosei and H. roosei  
to find Chrysomelids associated with H. roosei was very heavy in many  
exposed localities. The infection on H. roosei was very heavy in many  
cases. Careful examinations of H. roosei failed to show even a single  
infection on branches that were growing in close association with heavily  
infected H. roosei bushes.

8. No attempt was made to try to grow H. roosei in soil  
fruit because of the heavy frost which appears normal during conditions.

9. A number of the burned brush piles and a stand of additional  
piles have the same results as last year. The brush pile in the  
have any marked a fact upon the piles stand in the immediate vicinity.  
Roses were found growing around the edge of the piles but not in the  
center or in the hot part of the brush. In no case was there any  
reproduction of roses in large numbers around the -piles. However, some  
brushes were found near the edge of the brush, but none in the  
brushes within a radius of 1 and 5 feet from the edge of the brush.  
Conversely, where the bushes were found near the edge of the brush  
there were none within a radius of 1 and 5 feet from the edge of the brush.  
It, thus, it is possible to state that the brush pile burns influence  
Roses very little if any at all. If conditions are  
favorable for germination, seeds will be able to grow as long as the  
soil distance has been reached.

10. A lot of thirty or more (lost was a large) in last year.  
Various soil distances were applied, and bushes were of many  
Detailed description of this plot may be found in the last year's  
report. Some of the plotted bushes were found in last year's  
volunteers appeared on one of the shaded plots. This plot is on a  
rather dry exposure, and a few of the bushes may be found in the  
north of it.

11. During the season, new plants which were reproduced from  
collected and identified. It is planned to have a collection of all  
of the plants that are found in association with H. roosei. It is  
there is no immediate need for such a collection of plants, but it  
plans may call for a knowledge of these plants. This is not the  
names of about one hundred and twenty plants in it.

12. Collections were made of H. roosei leaves and stems in the  
two last-year and five-year plots. No collections have been made of the



other species for it does not seem that these species will be of major importance except R. nevadense along the streams and on the moist slopes.

13. Records were kept of humidity readings day by day along the rivers and streams. These records showed that during July the humidity averaged 85 per cent at 7 a.m., 25 per cent at noon and 40 per cent at 6 p.m. These readings were taken in the shade at camp.

14. Observations were made along old railroad grades to ascertain the frequency of Ribes. It was found that wherever conditions were favorable Ribes were quite numerous on these grades. Thus if Ribes bushes were found adjacent to the grade they would be found on the grades themselves. This was especially true on north slopes where moisture conditions were apparently ideal for the germination and survival of bushes. The grades on the south exposures showed very few bushes growing on them.

#### DISCUSSION AND CONCLUSIONS

It must be understood that any conclusions which may be drawn at this time are mostly the results of observation, for sufficient data are not available from which to make any definite statements.

The assumption was made that R. roezli bushes which were growing in mature timber did not produce fruit in abundance. The studies last year indicated that this was not true. During the past summer it was quite evident that the species in question produces a good crop of fruit in virgin timber.

The heavy frost killed a majority of the blossoms on the R. roezli before the fruits had a chance to set. At Hazel Green on some of the northern exposures on the cut-over lands a few bushes were found bearing heavily. As a whole there were few fruits to be found except in the mature stands or where the bushes had been protected from the frost. This meant that during 1929 practically all of the bushes producing good crops of fruit were in the mature timber because the bushes on the cut-over land had been injured by frost. Even some of the shrubs, such as Ceanothus cordulatus, Arctostaphylos patula and Symphoricarpos malus had their succulent growing parts killed when the plants were not in protected places.

The part that the rodents play in the dissemination of Ribes seed is still a matter of conjecture. It is known that chipmunks harvest most of the fruits and eat the seeds and pulp. Feeding experiments indicate that the seeds are thoroughly chewed before they are ingested. Consequently, they do not pass through the animal intact. In all probability many seeds are dropped by this animal, especially when it is suddenly frightened by something. A few fruits are left on the bushes each year. These dry up and fall to the ground. This is



other species for it does not seem that these species will be of any importance except R. nasutus along the stream and in the water.

15. Records were kept of monthly readings and of the amount of water in rivers and streams. These records show that during the month of August the water averaged 80 per cent at noon and 40 per cent at 5 p.m. These readings were taken in the shade at camp.

16. Observations were made along all railroad grades in search of the frequency of Ribes. It was found that wherever conditions were favorable Ribes were quite numerous on these grades. There is no doubt that bushes were found adjacent to the grade they would be found on the opposite side. This was especially true on north slopes where a favorable conditions were apparently ideal for the germination and survival of bushes. The grades on the south exposure show a very few bushes or none at all.

### DISCUSSION AND CONCLUSIONS

It must be understood that any conclusions drawn from the results of this time are mostly the results of observation, for while there are no data available from which to make any definite statements.

The assumption was made that R. roseifolium bushes which were found in the mountain timber did not produce fruit in abundance. The results of last year indicated that this was not true. During the past summer it was quite evident that the species in question produces a good crop of fruit in virgin timber.

The heavy frost killed a majority of the bushes on the mountain. Before the frost had a chance to set. At about 10 a.m. on August 15 the northern exposures on the cut-over lands a few bushes were found bearing heavily. As a whole there were few fruits to be found except in the narrow bands or where the bushes had been protected from the frost. This meant that during 1935 practically all of the bushes produced a crop of fruit were in the narrow timber because the bushes on the cut-over land had been injured by frost. Even some of the shrubs, such as Ceanothus cordulatus, Arctostaphylos uva-ursi and Symphoricarpos which their succulent growing leaves killed when the plants were not in protected places.

The part that the rodents play in the dissemination of Ribes seed is still a matter of conjecture. It is known that chipmunks, muskrats, and other rodents eat the seeds and that the seeds are thoroughly chewed before they are ingested. Consequently, they do not pass through the animal intact. In all probability many seeds are trodden by this animal, especially when it is especially frightened by something. A few fruits are left on the bushes each year. These drop and fall to the ground.



especially true of fruits which have been mildewed and as a result have become unpalatable for rodent consumption. However, during the current field season, it was difficult to find many ripe berries because they were taken by chipmunks as soon as they had ripened.

After logging there is a period of one or two years before *Ribes* begin to germinate in large numbers. Then there is a period of "maximum germination" which continues from two to three years after which there is a rapid decline. Much of the logging is done in the dry season. The ground is torn to pieces and dried out by the skidding operations. Therefore, it is not surprising that germination is slight the first year. Many of the stored seeds are probably deeply buried and are not uncovered until the coming of the rain and snow. It has been found that alternate freezing and thawing of *Ribes* seeds under artificial conditions tend to shorten the rest period of the seed and to permit germination in the laboratory. Perhaps alternate freezing and thawing are essential to the seeds which are stored in the soil before germination can take place.

There are many dry sites where only a few *Ribes* are found per acre. Probably there are seeds stored in the soil, but moisture conditions are not favorable for germination and survival of the bushes. On these dry sites seedlings are usually found growing in the shade of a rock, a log or a bush. A log in contact with the soil offers an attraction to the soil moisture and shade for the young plant. This may account for the finding of so many bushes growing near the edge of rocks and logs or even other species of bushes.

It is believed that the biggest factor controlling *Ribes* is the lack of moisture and that this factor may be closely linked with soil texture.

On favorable sites for *Ribes* where bushes have been removed, many seedlings are often found in the immediate vicinity the year following the removal. Disturbed areas where bushes were not removed failed to show any *Ribes* germination even on favorable sites. A few seedlings have appeared, but their numbers are very small as compared to the one where bushes are present. This would point to the fact that there is no large storage of seed in the soil over a long period. At present, the data are not at hand in sufficient numbers to draw any definite conclusions on this important point.

*Ribes* seedlings continue to appear for eight or ten years after an area has been cut over. Where fire has occurred on a north exposure, *R. nevadense* and *R. roezli* in the majority of cases appear in great profusion. On the drier slopes a fire does not seem to materially increase



especially some of those which have been observed and are being  
have become unsuitable for present consideration. However, the  
current field season, it was difficult to find any other  
because they were taken by mistake as some of the others.

After looking over the material of one or two years' collection  
Kilbes began to examine the material. There were in all about  
"an almost complete" which contained from two to three years' material  
which there is a wide choice. Much of the material is from the  
dry season. The ground is very dry and the material is very  
overgrown. Therefore, it is not surprising that the material is  
often the first year. Much of the material is probably from  
dried and are not recovered until the spring of the next year.  
It has been found that the material is very dry and the material is  
under difficult conditions that it is often the first year of the  
seed and to permit germination in the laboratory. Therefore, it is  
interesting and the material is the seed which is shown in the  
soil before germination and the phase.

There are many other things which are only a few years old and are  
some. Probably some of the seeds are in the soil, but the material is  
shown are not favorably for germination and a trial of the material.  
On these it is very difficult to find the material in the soil.  
at a rock, a lot of material is found in contact with the soil. This  
at a distance to the soil surface and the material is very dry and  
may account for the difficulty of the material. The material is very  
rock and logs or even other pieces of material.

It is believed that the factor of the material is the  
lack of moisture and that the factor is the closely linked with the  
material.

On favorable sites for the material there have been removed  
many seedlings and often found in the immediate vicinity of the material.  
ing the material. Disturbed areas were a factor were not removed from  
to show any other material. The material is very dry and the material  
have appeared, but their material is very dry and the material is  
where there are present. This is a point to be noted that the material  
large storage of seed in the soil over a long period. At present, the  
data are not as good in sufficient numbers to find any definite material  
states on this important point.

These seedlings continue to appear for eight or ten years after  
an area has been over. There has been a considerable amount of material  
H. nevadensis and H. nevadensis in the majority of cases and in some cases  
fission. On the other side a fire does not seem to be a factor in the







to decrease the number of

and the assistance is only a factor when the conditions are  
are favorable to the development of the present.



CONTROL RECONNAISSANCE ON THE  
LASSEN NATIONAL FOREST, CALIFORNIA, 1929

By

T. H. Harris  
Junior Forester.

PURPOSE.

Control reconnaissance was continued in California during the summer of 1929 as a further preliminary step in the acquisition of data necessary to the development of the blister-rust-control program in that state. Control reconnaissance aims to ascertain, by means of a rapid and systematic survey, the location and extent of the major sugar pine stands, the Ribes conditions existing therein, and any other factors that might influence the costs of insuring such areas protection against blister rust.

LOCATION OF WORK AND DESCRIPTION OF AREA

A. Location and Reason for Selection

The Lassen National Forest at the northern end of the Sierra Nevada in northeastern California was the scene of reconnaissance during the 1929 field season. Since to the north the commercial stands of sugar pine diminish in importance and value, and since reconnaissance was completed in 1928 on the Plumas National Forest immediately to the south, it seemed desirable to work the excellent sugar pine stands that intervene between these two areas.

B. General Description

The sugar-pine stands of the Lassen Forest lie on the west slope of the Sierra Nevada at elevations ranging from 4,000 to 6,500 feet. A number of streams, viz. Deer Creek, Mill Creek and Battle Creek, each flowing independently into the Sacramento River, have cut steep, V-shaped canyons through the region. Between these streams are plateau-like areas with a westerly slope which support good sugar pine. The topography south and southwest of Mt. Lassen is more broken and rugged than the gentler country to the west.

A good road system gives access to the major sugar-pine areas. Mineral, on the Red Bluff-Susanville Highway, was the base of supplies for the reconnaissance camp.

Five species of Ribes occur throughout the region. Listed in the order of their abundance they are: Ribes Roezli, R. nevadense,



CONTROL RECONNAISSANCE OF THE  
LASSEN NATIONAL FOREST, CALIFORNIA, 1932

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T. L. Harris  
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1932

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B. General Description

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A good road system gives access to the major sugar-pine areas. Mineral, on the Red Bluff-Sacramento Highway, was the base of expeditions for the reconnaissance camp.

Five species of Ribes occur throughout the region. Listed in the order of their abundance they are: Ribes cereum, R. nevadense, R.



R. inermis, R. viscosissimum and R. cereum. While R. nevadense and R. inermis are confined principally to streams and moist situations, R. Rcezli and R. viscosissimum are very generally distributed over drier situations as well, R. viscosissimum being a rare species, however. R. cereum is found at higher elevations, usually 6,000 feet and above, and frequently in large patches extending in some cases over a considerable area.

The principal timber trees indigenous to the northern Sierra Nevada are: sugar pine (Pinus lambertiana, Douglas), western yellow pine (P. ponderosa, Lawson), Douglas fir (Pseudotsuga taxifolia (Poir) Britton), white fir (Abies concolor (Gord.) Parry), and incense cedar (Libocedrus decurrens, Torrey). These compose the stands in such varying percentages that at times it is extremely difficult to distinguish the timber types so well defined in the southern Sierra Nevada. An attempt was made, however, to classify the forest into the types hitherto used, namely: sugar pine-yellow pine mature (SP-YP Mat.) and cut-over (SP-YP CO.) types, sugar pine-fir mixed (SP-F Mix.) and cut-over (SP-F CO.), stream mature (St. Mat.), brush, meadow, and minor types. Sugar pine-yellow pine usually occurs in mature stands, while sugar pine-fir occurs in mixed-age classes. Brush type designates solid fields of brush with little or no timber cover, and the heading, Minor Types, includes miscellaneous classifications such as pure fir or pure yellow-pine types.

The principal brush genera are: Arctostaphylos (Manzanita), Ceanothus, Amelanchier, Castanopsis, Cornus, Prunus, Quercus and Salix.

#### C. Detailed Location

For purposes of analysis of data the total area reconnoissanced is divided into three sub-areas which are naturally separable from each other. Descriptions of these follow.

1. The Deer Creek unit comprises the plateau country between Deer Creek and Mill Creek, bounded on the southwest by the lower limit of sugar-pine growth and on the north and east by the disappearance of sugar pine which roughly coincides with the route of the Red Bluff-Susanville Highway. Excellent stands of sugar pine occur on the two and one-half townships which this unit includes. The northern three-quarters of the area is moderately free from brush.

The larger part of the timber is owned by the Red River Lumber Company and the firm of Curtis, Collins and Holbrook; the remainder is in federal ownership. At present the Red River Lumber Company is logging the northeastern edge of the area.







2. The Yellow Jacket unit includes the sugar-pine type between Mill Creek and Battle Creek. It was cut-over thirty or forty years ago by the Diamond Match Company, which is the present owner of the greater part of this unit. The Forest Service administers scattering sections. The timber growth resulting after logging is a heterogenous mixture of types composed of the timber species of all ages and sizes and in varying percentages. Brush and dense reproduction are prevalent; in some parts sugar-pine reproduction is good, but is scattering in general.

3. The Rock Creek unit defines the excellent body of sugar-pine type lying between the South Fork of Battle Creek on the south, Latour Butte on the north, Mt. Lassen on the east and the limit of sugar-pine growth on the west. Ownership is divided between the Diamond Match Company and several small operators. The latter are cutting the sugar pine in the northern part in the vicinity of Viola and Latour Butte. The Federal government owns a little timber along the eastern edge of the unit. There occurs on Sugar Pine Flat, an area of approximately 6 sections, the finest body of mature sugar pine observed during the survey.

#### METHODS OF WORK

##### A. Field Methods

Control reconnaissance employed the same field methods for intensive work as were used during 1927 and 1928. Extensive reconnaissance was discontinued because of its proved inefficiency in 1928 under similar conditions. A full explanation of the intensive method is to be found in the annual blister-rust-control report for 1927 under "Control Reconnaissance on Federal Lands, California". Briefly, the basis for the work is the one-man crew working half a section a day using the strip method with sample plots, and the system of public land surveys.

A project leader, five assistants, and a cook composed the field personnel.

##### B. Office Methods

All office computations, summaries of field data, and the preparation of tables were done by Mr. D. R. Miller of this Office. Reconnaissance data are transferred from section summary sheets to township work sheets where they are readily available, and township maps on a scale of 2" = 1 mile are made from the individual field section maps. These constitute the permanent records of reconnaissance.



3. The Yellow Jacket unit includes the entire area of the section lying between the Creek and Battle Creek. It was cut over fairly or partly over by the Diamond Match Company, which is the present owner of the greater part of the unit. The Forest Service administers scattered parcels. The timber tract resulting after logging is a heterogeneous mixture of types composed of the timber species of all ages and sizes and in varying proportions. About the same proportion are preserved; in some types such - and reproduction is good, but is scattering in general.

4. The Rock Creek unit includes the excellent body of timber lying between the south fork of Battle Creek on the south, between the north, Mt. Lassen on the east and the limit of water-shed growth on the west. Ownership is divided between the Diamond Match Company and several small operators. The latter are cutting the sugar pine in the southern part in the vicinity of Yuba and Lassen Butte. The National Government owns a little timber along the eastern edge of the unit. There are some sugar pine first, an area of approximately 6 sections, the finest body of mature sugar pine observed during the survey.

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# WORK PERFORMED AND RESULTS OBTAINED

The following tables summarize the work and results of control reconnaissance performed on the Lassen National Forest, California. The total area covered is shown by townships and sections and by timber types, and in Table No. 4 an analysis of Ribes data is given.

TABLE NO. 1

## PER CENT OF FOREST RECONNAISSANCED.

Classification	Sub-Totals		Totals	
	Acres	Per Cent	Acres	Per Cent
Gross Area of Forest			1,306,807	100.00
Gross Area of SP Types	192,960	100.0	192,960	14.80
Area reconnaissanced	117,927	61.1		9.00

TABLE NO. 2

## TYPE DIVISION OF TOTAL AREA RECONNAISSANCED

Eradication Types	Acres	Per Cent
Sugar Pine Types		
SP-YP Mature	48,875.6	41.5
SP-YP Cut-over	3,702.5	3.1
SP-Fir Mixed	45,309.3	38.4
SP-Fir Cut-over	3,529.0	3.0
Totals	101,416.4	86.0
Stream Type Mature	844.1	0.7
Other Types		
Brush	7,102.8	6.0
Meadow	1,218.2	1.1
Minor Types	7,345.5	6.2
Totals	15,666.5	13.3
Grand Totals	117,927.0	100.0



# WORK PERFORMED AND RESULTS OBTAINED

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TABLE NO. 1

## PER CENT OF FOREST RECOMMENDED

Classification	Sub-Totals	Totals
Gross Area of Forest	1,306,807	1,306,807
Area of 25 Types	1,280,000	1,280,000
Area recommended	117,327	117,327

TABLE NO. 2

## TYPE DIVISION OF TOTAL AREA RECOMMENDED

Classification Types	Acres	Per Cent
25-YP Mixed	48,173.8	41.5
27-YP Out-over	3,708.3	3.1
29-YP Mixed	43,708.3	37.4
31-YP Out-over	3,669.0	3.1
Totals	101,179.4	86.0
Stream Type Mixed	344.1	0.3
Other Types	7,103.2	6.0
Brush	1,113.3	1.1
Meadow	7,103.2	6.0
Minor Types	12,668.2	10.8
Totals	117,327.0	100.0



TABLE NO. 3

SECTIONS WORKED RECONNAISSANCE  
CALIFORNIA, 1929

Locality	T. R.	Sections by Number	Totals	
			Section	Acres
Rock Creek	29N 2E	2,3,4,11	4	3,520
	29N 3E	4,5,6,7,8,9,16,17,18	9	5,747
	30N 2E	1,12,24,25,35,36	6	3,440
	30N 3E	3,4,5,6,7,8,9,10,13,15,16,17,18,19,20, 21,22,27,28,29,30,31,32,33,34	25	14,064
	31N 3E	5,6,8,15,16,17,20,21,28,29,30,31,32,33	14	8,816
	32N 2E	21,22,25,26,27,28,29,35,36	9	5,440
	32N 3E	31,32	2	1,120
Yellow Jacket	27N 2E	1,2	2	1,280
	27N 3E	6	1	560
	28N 2E	1,12,23,24,25,26,35,36	8	5,120
	28N 3E	7,19,20,29,30,31,32	7	4,480
	29N 2E	26,35,36	3	1,600
	29N 3E	27,28,29,31,32	5	3,200
	27N 3E	11,12,13,14,15	5	2,900
Deer Creek	27N 4E	2,3,4,5,6,7,8,9,10,17,18	11	7,680
	28N 3E	1	1	960
	28N 4E	1,2,3,4,5,8,9,10,11,12,13,14,15,16,17, 21,22,23,24,25,26,27,33,34,35,36	26	16,640
	28N 5E	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16, 17,18,19,20,23,24,30,31	24	15,360
	28N 6E	5,6,7,8,16,17,18,19,20,21,22	11	7,040
	29N 4E	35,36	2	1,280
	29N 5E	25,26,27,31,32,33,34,35,36	9	5,760
	29N 6E	30,31,32	3	1,920
Totals			187	117,927



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Locality	T. F.	Longitude	Latitude
Rock	307 32	8. 3. 4. 11	1. 3. 4. 11
Creek	308 34	8. 3. 4. 11	1. 3. 4. 11
	309 35	8. 3. 4. 11	1. 3. 4. 11
	310 36	8. 3. 4. 11	1. 3. 4. 11
Yellow	311 37	8. 3. 4. 11	1. 3. 4. 11
	312 38	8. 3. 4. 11	1. 3. 4. 11
	313 39	8. 3. 4. 11	1. 3. 4. 11
Jacks	314 40	8. 3. 4. 11	1. 3. 4. 11
	315 41	8. 3. 4. 11	1. 3. 4. 11
	316 42	8. 3. 4. 11	1. 3. 4. 11
Dart	317 43	8. 3. 4. 11	1. 3. 4. 11
	318 44	8. 3. 4. 11	1. 3. 4. 11
	319 45	8. 3. 4. 11	1. 3. 4. 11
Creek	320 46	8. 3. 4. 11	1. 3. 4. 11
	321 47	8. 3. 4. 11	1. 3. 4. 11
	322 48	8. 3. 4. 11	1. 3. 4. 11
Totals	323 49	8. 3. 4. 11	1. 3. 4. 11
	324 50	8. 3. 4. 11	1. 3. 4. 11
	325 51	8. 3. 4. 11	1. 3. 4. 11



TABLE NO. 4

ACREAGE AND RIBES ANALYSIS OF AREAS RECONNAISSANCED  
CALIFORNIA 1929

## DEER CREEK

## YELLOW JACKET

Eradication Types	Acres	Ribes Per Acre			Eradication Types	Acres	Ribes Per Acre		
		Ribes Roessleri	Ribes nevadense	Ribes vis- inermis			Ribes Roessleri	Ribes nevadense	Ribes vis- inermis
SP-YF Mature	21,231.6	9.74	1.13	0.02	SP-YF Mature	8,042.4	31.31	1.09	
SP-YF Outover	2,234.0	14.62			SP-YF Outover	1,345.5	16.10		
SP-Fir Mixed	24,631.7	15.51	2.74	0.17	SP-Fir Mixed	5,280.7	46.74	7.25	0.04
SP-Fir Outover	3,334.0	10.47	0.17		SP-Fir Outover	-	-	-	-
Stream Mature	359.6	34.42	132.23	27.96	Stream Mature	189.1	47.30	76.35	1.22
Brush	3,678.2	7.55	1.32		Brush	272.9	2.66		
Meadow	1,049.7	8.51	0.85	0.54	Meadow	65.0			
Minor Types	2,621.2	10.07	0.82		Minor Types	344.4	7.39		
Totals and Averages	59,540.0	14.62	15.26	2.98	Totals and Averages	16,340.0	36.63	19.95	4.20
			1.14	35.49				0.98	61.96

## TOTALS

## ROCK CREEK

Eradication Types	Acres	Ribes Per Acre			Eradication Types	Acres	Ribes Per Acre		
		Ribes Roessleri	Ribes nevadense	Ribes vis- inermis			Ribes Roessleri	Ribes nevadense	Ribes vis- inermis
SP-YF Mature	19,601.6	6.90	0.16	0.07	SP-YF Mature	48,675.6	12.40	0.74	0.03
SP-YF Outover	123.0	15.00			SP-YF Outover	3,702.5	15.26		
SP-Fir Mixed	15,196.9	19.01	2.36	0.04	SP-Fir Mixed	45,309.3	20.30	3.15	0.10
SP-Fir Outover	195.0				SP-Fir Outover	3,529.0	10.05	0.17	
Stream Mature	295.4	16.73	130.95	38.06	Stream Mature	844.1	33.77	115.95	26.09
Brush	3,061.7	31.15			Brush	7,102.8	14.30	0.81	
Meadow	103.5	8.23	31.67	3.33	Meadow	1,218.2	8.49	4.34	0.94
Minor Types	3,579.9	15.28	0.18		Minor Types	7,345.5	11.55	0.46	
Totals and Averages	42,147.0	13.39	15.11	4.14	Totals and Averages	117,927.0	17.96	15.98	3.56
			0.02	32.70				0.70	0.59

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# STATEMENT AND ANALYSIS OF COSTS

The cost of control reconnaissance was \$.0289 per acre, derived by dividing the total field cost of the project by the total number of acres reconnoissanced.

An analysis of reconnaissance field costs is given in Table No.

5.

TABLE NO. 5

## CONTROL RECONNAISSANCE COSTS

Classification	Sub-Total		Total	
	Cost	Per Cent	Cost	Per Cent
1. Payroll				
a. Supervision (Salary & travel expenses*)	\$ 914.93	40.1		
b. Labor (Salaries and expenses)	1,367.67	59.9		
Totals	\$2,282.60	100.0	\$2,282.60	66.8
2. Subsistence**				
a. Cost of supplies	512.73	63.2		
b. Transportation of supplies	31.24	3.9		
c. Cost of cooking	267.00	32.9		
Totals	\$ 810.97	100.0	\$ 810.97	23.8
3. Transportation of men	\$ 55.85	100.0	\$ 55.85	1.6
4. Miscellaneous Travel	\$ 67.89	100.0	\$ 67.89	2.0
5. Equipment				
a. 1/3 of 1929 purchase	26.67	13.4		
b. 1/3 of 1928 purchase	21.47	10.8		
c. 1/3 of 1927 purchase	48.66	24.5		
d. Supplies not equipment	10.13	5.1		
e. Transportation of equipment	73.66	37.0		
f. Miscellaneous	18.32	9.2		
Totals	\$ 198.91	100.0	\$ 198.91	5.8
Grand Total			\$3,416.22	100.0

\*Includes 1,266 miles in Government truck on reconnaissance scouting at \$.0730 per mile.

\*\*Number of meals served - 1,873; cost per meal - \$0.433.



# ANALYSIS OF RECOMMENDATIONS

The cost of control recommendations was \$1,755 per mile, based on dividing the total field cost of the project by the total miles recommended.

An analysis of recommendations field costs is given in Table 1.

6.

## TABLE 1

### FIELD COSTS BY CATEGORY

Category	Cost	Cost	Cost
1. Payroll			
a. Supervision (Salary & travel expenses)	\$2,527.87		
b. Labor (Salaries and expenses)	\$2,527.87		
c. Total	\$5,055.74		
2. Subcontractor			
a. Cost of supplies	\$2,527.87		
b. Transportation of supplies	\$2.52		
c. Cost of contract	\$5,055.74		
d. Total	\$10,111.48		
3. Transportation of men	\$2,527.87		
4. Miscellaneous travel	\$2,527.87		
5. Equipment			
a. 1/3 of 1963 purchase	\$2,527.87		
b. 1/3 of 1962 purchase	\$2,527.87		
c. 1/3 of 1961 purchase	\$2,527.87		
d. Supplies not equipment	\$2,527.87		
e. Transportation of equipment	\$2,527.87		
f. Miscellaneous	\$2,527.87		
g. Total	\$15,103.00		
Grand Total	\$30,206.99		

\*Includes 1,888 miles in Government truck on recommendation accounting.

\$1,070 per mile.

\*\*Number of miles covered - 1,755; cost per mile - \$1,755.



EXPERIMENTAL RIBES ERADICATION, PLUMAS  
NATIONAL FOREST, CALIFORNIA

By

W. V. Benedict  
Assistant Forest Pathologist

INTRODUCTION

During the period 1926-1928 inclusive, experimental Ribes eradication operations were conducted on the Stanislaus National Forest. This forest region is within the optimum range of sugar pine development. In 1929 the scene of activities was shifted to the Plumas National Forest. The Plumas Forest is located in the northern commercial range of sugar pine and represents a less select site for sugar pine growth.

PURPOSE OF WORK

Within the wide range of latitude included by the sugar pine belt, it is obvious that working conditions, Ribes conditions and timber conditions will vary considerably. Ribes eradication data for the Stanislaus region would not be directly applicable to other, more or less remotely located sugar pine areas. The purpose of the 1929 operation was to procure the necessary Ribes eradication information for formulating blister-rust control measures for the northern Sierra region. This included information on such points as:

- a. Classification of eradication types and the acquisition of cost data for such types.
- b. Adaption of Stanislaus methods of work to the Plumas locality.
- c. The continued training of personnel.

LOCATION OF WORK

The area selected for the 1929 work is fairly well centered in the sugar pine type of the Plumas National Forest. It is located in township 24 north, ranges 8 and 9 east, Mt. Diablo Meridian, approximately 9 miles west of the town of Quincy. The general area in this locality comprising some 37,995 acres, of which the eradication area forms a part, makes up the Meadow Valley working circle of the Plumas Forest. For exact description of boundaries, refer to map accompanying this report.

A. Reasons for Selecting Area

The control reconnaissance data, supplemented by scouting trips of experienced eradication men to the most promising areas, formed the basis for selecting this area. Reasons for this decision were:



EXPERIMENTAL FIRE ERADICATION, PUMAS  
NATIONAL FOREST, CALIFORNIA

BY

A. E. Benedict

Assistant Forest Pathologist

INTRODUCTION

During the period 1928-1932 inclusive, experimental fire eradication operations were conducted on the Pumas National Forest. This forest region is within the optimum range of fire in the development of the Pumas National Forest. In 1929 the scene of activities was shifted to the Pumas National Forest. The Pumas Forest is located in the northern, somewhat range of growth, pine and represents a less select site for sugar pine growth.

PURPOSE OF STUDY

Within the wide range of latitude included by the sugar pine belt, it is obvious that working conditions, fire conditions and timber conditions will vary considerably. A fire eradication study for the Stanislaus region would not be directly applicable to other, more or less remotely located sugar pine areas. The purpose of the 1932 operation was to procure the necessary fire eradication information for formulating district-wide control measures for the northern forest region. This included information on such points as:

- a. Classification of eradication types and the eradication of cost data for such types.
- b. Adoption of Stanislaus methods of work to the Pumas locality.
- c. The continued training of personnel.

LOCATION OF FIRE

The area selected for the 1932 work is fairly well centered in the sugar pine type of the Pumas National Forest. It is located in township 34 north, range 8 east, 3d, 11th E. riding, approximately 9 miles east of the town of Quincy. The general area in this locality comprising some 37,955 acres, of which the eradication area forms part, makes up the Meadow Valley working circle of the Pumas Forest. For exact description of boundaries, refer to map accompanying this report.

Reasons for selecting area

The control reconnaissance team, supplemented by scouting fire of experienced eradication men to the most promising areas, found the best for selecting this area. Reasons for this decision were:



(1) The Meadow Valley unit represented typical timber site classes (No. II and III) for the region.

(2) Sugar pine was an average representative in the stand.

(3) Three species of Ribes common to the northern Sierra region were present on the area.

(4) Working conditions were typical of the sugar pine type of the locality.

(5) The area was made readily accessible by a series of roads and trails.

#### B. Description of Area.

The area comprising this unit lies in a natural basin formed by Spanish Creek and its various tributaries. The basin, of which Meadow Valley forms the center, is surrounded by high ridges on all sides except the east, where Spanish Creek leaves Meadow Valley and runs into American Valley.

The elevation ranges from 3,700 feet around the valley to 5,200 feet on the high ridges.

The topography is rugged and irregular, being cut up by numerous streams with steep canyons.

Lava and serpentine rock formations are numerous.

The forest on this area is composed of a mixed stand of the following species:

Sugar pine	21.8 per cent
Western yellow pine	26.6 per cent
Douglas fir	23.4 per cent
White fir	17.0 per cent
Incense cedar	6.2 per cent

The stand on the timbered area runs approximately 30,000 feet, board measure, per acre, of which 6,540 board feet are sugar pine. (These figures and percentages are based on estimates made by the United States Forest Service for the Meadow Valley working circle.) The stand is largely a composition of all age classes, with a prevalence of mature and over-mature trees, in varying percentages of the above timber species.



(1) The Meadow Valley Unit represents typical stream-side  
classes No. II and III for the region.

(2) Cedar pine was an average representative in the stand.

(3) Three species of pines common to the Western Sierra region  
were present on the mesa.

(4) Working conditions were similar to the cedar pine type of the  
locality.

(5) The mesa was made readily accessible by a series of trails and  
trails.

### 2. Description of area.

The area containing this unit lies in a narrow basin formed  
by Spanish Creek and its various tributaries. The basin, or valley,  
Meadow Valley for the center, is surrounded by high ridges on all  
sides except the east, where Spanish Creek leaves Meadow Valley and  
turns into Mexican Valley.

The elevation ranges from 4,700 feet around the valley to  
5,200 feet on the high ridges.

The topography is rugged and irregular, being cut up by  
numerous streams with deep canyons.

Lava and serpentine rock formations are numerous.

The forest on this mesa is composed of a mixed stand of the  
following species:

Spanish pine 31.7 per cent  
Western yellow pine 24.5 per cent  
Douglas fir 23.1 per cent  
White fir 17.0 per cent  
Incense cedar 3.7 per cent

The stand on the mesa is a mixed stand of the above species, with  
ponderosa pine, but none of which is over 100 years old and many of the  
(These pines and ponderosa are found in scattered groups of the  
United States Forest Service for the Spanish Valley working circle.)  
The stand is largely a collection of small trees, with a few  
of mature and over-mature trees, in varying proportions of the above  
species.



Openings in the stand, resulting from fire or insect damage, contain considerable underbrush composed of various species of Ceanothus, manzanita, buckthorn, service-berry, oaks and chinquapin. Along the streams species of willow and alder are found.

### C. Eradication Types.

Ribes data and cost data were recorded on the basis of eradication classes, for each eradication type. Four eradication types were recognized, viz., sugar pine-yellow pine-fir type, sugar pine-yellow pine-fir cut-over type, stream type and brush type.

Because of the more or less even representation of sugar pine, yellow pine, Douglas fir and white fir in the stand it was difficult to designate a type as sugar pine-fir or sugar pine-yellow pine in this locality.

The cut-over type, as the name indicates, was an area which had been logged. Cutting had been done several years ago according to Forest Service marking practice.

The brush type consisted of treeless areas on which occurred underbrush of the several species mentioned above.

Stream type consisted of the narrow belt of land bordering water courses.

Four eradication classes, based upon the average acreage of work an eradication crew could do in a day, were used to show the variation in working conditions within an eradication type.

### D. Ribes Species.

The three Ribes species indigenous to the area were Ribes Roetzli constituting 72 per cent of the total, R. nevadense consisting of 23 per cent of the total and R. inerme numbering 5 per cent of the total.

R. Roetzli was the least exacting in growth requirements and occurred on practically all sites. R. nevadense was largely restricted to stream bottoms and cool moist slopes. R. inerme was confined almost entirely to stream type.

### METHODS OF WORK

The eradication project, as organized this season, consisted of two units, one 25-man camp under the supervision of D. R. Miller



Opinions in the above cases, resulting from first-hand observation, contain considerable information regarding the habits of various species of birds, mammals, reptiles, service-birds, and other animals. Along the entire species of willow and other trees.

C. Classification Types

[illegible]

Because of the more or less even distribution of water pine, yellow pine, Douglas fir and white fir in the area it was difficult to designate a type or sugar pine-yellow pine in this locality.

The cut-over type, as the late collector, was an early method had been favored. Cutting had been done several years ago according to Forest Service existing practice.

The gross type consisted of gross type in which occurred

Stream type consisted of the lower half of food production.

work an eradication crew could be in a day, was used to show the  
variation in working conditions with an eradication crew.

• 1910000 2000000 •

total.  
of 23 per cent of the total and 1.17 per cent of the  
total consisting 72 per cent of the total and 1.17 per cent of the  
total.

[illegible]

The eradication project, as organized this season, consisted of two units, one 25-man unit under the supervision of H. E. Miller



(Camp 1) and one 15-man camp under the supervision of E. L. Baxter (Camp 2). Each camp operated independently under the supervision of the project leader. All equipment was procured from Spokane. Subsistence and incidental supplies were procured locally at Quincy. Transportation of men, supplies and equipment was provided by government owned  $1\frac{1}{2}$ -ton truck.

During the fall of 1928 the area selected for experimental Ribes eradication work was intensively surveyed as described in the 1928 pre-eradication report. The results of this survey supplied the necessary information for planning and conducting the eradication operation.

Sections, or convenient sub-divisions such as  $\frac{1}{2}$  sections or  $\frac{1}{4}$  sections, were used as working units.

Three-man eradication crews, with foreman working in line, were used exclusively by both camps. Because of the uniform and abundant distribution of Ribes very little scout work was done.

Both twine and small paper squares were used as guide trail. Paper squares were needed to supplant twine near places of habitation and in vicinity of stock driveways and salting grounds.

Each crewman used a special pick mattock to aid in extracting Ribes. All of the crowns and larger roots were removed to prevent sprouting.

The checking work was done by the camp bosses, assisted when necessary by an experienced eradication man. Advance check strips every 20 chains across a section,  $\frac{1}{4}$  chain wide and divided into 2-chain transects were established as a part of the pre-eradication work the previous season. These strips were all re-checked after the section had been covered by eradication crews. Special transect traverses were established in stream type and checked similarly to other advance check strips. Information from advance check data made it possible to block out 10.1% of the area as Ribes free.

Methods of pre-eradication were identical with methods developed and described in 1928. The pre-eradication work was done by two experienced eradication men.



(Camp 1) and one 16-man camp under the supervision of 12 men (Camp 2). Each camp operated independently under the supervision of the project leader. All equipment was procured from the United States and included supplies were procured locally in the Philippines. Transportation of men, supplies and equipment was provided by the government-owned 12-ton truck.

During the fall of 1953 the area selected for eradication of rice eradication work was intensively surveyed as described in the pre-eradication report. The results of this survey established the necessary information for planning and conducting the eradication operation.

Sections, or compounds and districts each with sections of 4 sections, were used as working units.

Three-man eradication crews, with members working in 12-man sections, were used exclusively by both camps. Because of the unit size, abundant distribution of rice was little concern was given.

Both teams and small power sprayers were used as sprayers. Paper sprayers were needed to spray the rice near the edge of the field and in vicinity of stock driveways and existing fences.

Each crewman used a special rice sprayer to aid in eradication. All of the crews and power sprayers were removed to prevent spraying.

The checking work was done by the team bosses, assisted when necessary by an experienced eradication man. Advance check and a every 30 chains across a section, 1/2 chain wide and divided into 1/2 chain transverse were established as a part of the pre-eradication work the previous season. These series were all re-checked after the section had been covered by eradication crews. Special attention transverse were established in straight type and checked similarly to other advance check strips. In addition from advance check strips it possible to check out 10% of the areas as rice free.

Methods of pre-eradication were identical. The pre-eradication work was done by two experienced eradication men.



## RESULTS OF WORK

### A. Eradication

The following tables summarize the results of the 1929 field operation. For purposes of comparison and analysis the results of the work are shown first, for the project as a whole and second, for each camp unit.

CAMP UNIT	RESULTS OF WORK									
	1	2	3	4	5	6	7	8	9	10
1. Camp Unit	1	2	3	4	5	6	7	8	9	10
2. Camp Unit	1	2	3	4	5	6	7	8	9	10
3. Camp Unit	1	2	3	4	5	6	7	8	9	10
4. Camp Unit	1	2	3	4	5	6	7	8	9	10
5. Camp Unit	1	2	3	4	5	6	7	8	9	10
6. Camp Unit	1	2	3	4	5	6	7	8	9	10
7. Camp Unit	1	2	3	4	5	6	7	8	9	10
8. Camp Unit	1	2	3	4	5	6	7	8	9	10
9. Camp Unit	1	2	3	4	5	6	7	8	9	10
10. Camp Unit	1	2	3	4	5	6	7	8	9	10
11. Camp Unit	1	2	3	4	5	6	7	8	9	10
12. Camp Unit	1	2	3	4	5	6	7	8	9	10
13. Camp Unit	1	2	3	4	5	6	7	8	9	10
14. Camp Unit	1	2	3	4	5	6	7	8	9	10
15. Camp Unit	1	2	3	4	5	6	7	8	9	10
16. Camp Unit	1	2	3	4	5	6	7	8	9	10
17. Camp Unit	1	2	3	4	5	6	7	8	9	10
18. Camp Unit	1	2	3	4	5	6	7	8	9	10
19. Camp Unit	1	2	3	4	5	6	7	8	9	10
20. Camp Unit	1	2	3	4	5	6	7	8	9	10
21. Camp Unit	1	2	3	4	5	6	7	8	9	10
22. Camp Unit	1	2	3	4	5	6	7	8	9	10
23. Camp Unit	1	2	3	4	5	6	7	8	9	10
24. Camp Unit	1	2	3	4	5	6	7	8	9	10
25. Camp Unit	1	2	3	4	5	6	7	8	9	10
26. Camp Unit	1	2	3	4	5	6	7	8	9	10
27. Camp Unit	1	2	3	4	5	6	7	8	9	10
28. Camp Unit	1	2	3	4	5	6	7	8	9	10
29. Camp Unit	1	2	3	4	5	6	7	8	9	10
30. Camp Unit	1	2	3	4	5	6	7	8	9	10
31. Camp Unit	1	2	3	4	5	6	7	8	9	10
32. Camp Unit	1	2	3	4	5	6	7	8	9	10
33. Camp Unit	1	2	3	4	5	6	7	8	9	10
34. Camp Unit	1	2	3	4	5	6	7	8	9	10
35. Camp Unit	1	2	3	4	5	6	7	8	9	10
36. Camp Unit	1	2	3	4	5	6	7	8	9	10
37. Camp Unit	1	2	3	4	5	6	7	8	9	10
38. Camp Unit	1	2	3	4	5	6	7	8	9	10
39. Camp Unit	1	2	3	4	5	6	7	8	9	10
40. Camp Unit	1	2	3	4	5	6	7	8	9	10
41. Camp Unit	1	2	3	4	5	6	7	8	9	10
42. Camp Unit	1	2	3	4	5	6	7	8	9	10
43. Camp Unit	1	2	3	4	5	6	7	8	9	10
44. Camp Unit	1	2	3	4	5	6	7	8	9	10
45. Camp Unit	1	2	3	4	5	6	7	8	9	10
46. Camp Unit	1	2	3	4	5	6	7	8	9	10
47. Camp Unit	1	2	3	4	5	6	7	8	9	10
48. Camp Unit	1	2	3	4	5	6	7	8	9	10
49. Camp Unit	1	2	3	4	5	6	7	8	9	10
50. Camp Unit	1	2	3	4	5	6	7	8	9	10
51. Camp Unit	1	2	3	4	5	6	7	8	9	10
52. Camp Unit	1	2	3	4	5	6	7	8	9	10
53. Camp Unit	1	2	3	4	5	6	7	8	9	10
54. Camp Unit	1	2	3	4	5	6	7	8	9	10
55. Camp Unit	1	2	3	4	5	6	7	8	9	10
56. Camp Unit	1	2	3	4	5	6	7	8	9	10
57. Camp Unit	1	2	3	4	5	6	7	8	9	10
58. Camp Unit	1	2	3	4	5	6	7	8	9	10
59. Camp Unit	1	2	3	4	5	6	7	8	9	10
60. Camp Unit	1	2	3	4	5	6	7	8	9	10
61. Camp Unit	1	2	3	4	5	6	7	8	9	10
62. Camp Unit	1	2	3	4	5	6	7	8	9	10
63. Camp Unit	1	2	3	4	5	6	7	8	9	10
64. Camp Unit	1	2	3	4	5	6	7	8	9	10
65. Camp Unit	1	2	3	4	5	6	7	8	9	10
66. Camp Unit	1	2	3	4	5	6	7	8	9	10
67. Camp Unit	1	2	3	4	5	6	7	8	9	10
68. Camp Unit	1	2	3	4	5	6	7	8	9	10
69. Camp Unit	1	2	3	4	5	6	7	8	9	10
70. Camp Unit	1	2	3	4	5	6	7	8	9	10
71. Camp Unit	1	2	3	4	5	6	7	8	9	10
72. Camp Unit	1	2	3	4	5	6	7	8	9	10
73. Camp Unit	1	2	3	4	5	6	7	8	9	10
74. Camp Unit	1	2	3	4	5	6	7	8	9	10
75. Camp Unit	1	2	3	4	5	6	7	8	9	10
76. Camp Unit	1	2	3	4	5	6	7	8	9	10
77. Camp Unit	1	2	3	4	5	6	7	8	9	10
78. Camp Unit	1	2	3	4	5	6	7	8	9	10
79. Camp Unit	1	2	3	4	5	6	7	8	9	10
80. Camp Unit	1	2	3	4	5	6	7	8	9	10
81. Camp Unit	1	2	3	4	5	6	7	8	9	10
82. Camp Unit	1	2	3	4	5	6	7	8	9	10
83. Camp Unit	1	2	3	4	5	6	7	8	9	10
84. Camp Unit	1	2	3	4	5	6	7	8	9	10
85. Camp Unit	1	2	3	4	5	6	7	8	9	10
86. Camp Unit	1	2	3	4	5	6	7	8	9	10
87. Camp Unit	1	2	3	4	5	6	7	8	9	10
88. Camp Unit	1	2	3	4	5	6	7	8	9	10
89. Camp Unit	1	2	3	4	5	6	7	8	9	10
90. Camp Unit	1	2	3	4	5	6	7	8	9	10
91. Camp Unit	1	2	3	4	5	6	7	8	9	10
92. Camp Unit	1	2	3	4	5	6	7	8	9	10
93. Camp Unit	1	2	3	4	5	6	7	8	9	10
94. Camp Unit	1	2	3	4	5	6	7	8	9	10
95. Camp Unit	1	2	3	4	5	6	7	8	9	10
96. Camp Unit	1	2	3	4	5	6	7	8	9	10
97. Camp Unit	1	2	3	4	5	6	7	8	9	10
98. Camp Unit	1	2	3	4	5	6	7	8	9	10
99. Camp Unit	1	2	3	4	5	6	7	8	9	10
100. Camp Unit	1	2	3	4	5	6	7	8	9	10



1. Introduction

The following table summarizes the results of the first phase of the project. For purposes of comparison and analysis, the results of the work are shown first, for the project as a whole and second, for each camp unit.



TABLE NO. 1

RESULTS OF ERADICATION BY SECTIONS  
(Both Camps)

Section	Eradication Type	Acres	Ribes Eradicated			Ribes Per Acre	Man-Days On Eradication	Acres Man-Day	Cost per Acre
			R. Roestli	R. nevad.	R. inerme				
21	SP-YF-Fir	409.5	47,300	8,648	22	55,970	136.6	225.8	1.7
21	Stream	76.3	16,625	15,949	2,791	35,365	463.5	141.1	0.5
21	SP-YF-Fir-Out-over	154.2	35,879	1,425	-	37,304	241.9	69.5	2.2
28	SP-YF-Fir	258.7	26,163	12,641	-	38,804	150.0	181.3	1.4
28	Stream	26.3	3,535	8,844	-	12,369	470.3	90.3	0.3
22	SP-YF-Fir	40.0	2,569	1,067	-	3,636	90.9	18.2	2.0
22	Stream	30.0	2,376	3,594	11,762	17,732	591.1	47.9	0.6
22	SP-YF-Fir-Out-over	260.0	6,059	454	-	6,513	25.0	45.8	5.6
27	SP-YF-Fir	615.0	43,783	11,323	-	55,109	86.9	272.9	2.3
27	Stream	25.0	2,713	7,433	1,013	11,159	446.4	48.0	0.5
16	SP-YF-Fir	460.0	22,185	6,931	-	29,116	63.2	118.4	3.9
16	Do-blocked out Ribes Free	155.0	-	-	-	-	-	2.5	62.0
16	Stream	25.0	2,088	9,040	172	11,300	452.0	59.8	0.4
26	Stream	5.6	302	983	7,337	8,622	1,539.9	25.4	0.2
31	SP-YF-Fir	359.1	61,394	6,942	-	68,336	190.3	221.8	1.6
31	Stream	27.9	7,852	5,019	-	12,871	461.3	37.5	0.7
31	Brush	53.0	21,143	231	-	21,374	403.3	95.4	0.5
31	SP-YF-Fir-blocked out Ribes Free	40.0	-	-	-	-	-	0.2	-
30	SP-YF-Fir	427.1	35,148	6,423	-	41,571	97.3	180.4	2.4
30	Stream	36.9	1,997	3,258	-	5,255	142.4	26.1	1.4
30	SP-YF-Fir-blocked out Ribes Free	176.0	-	-	-	-	-	0.5	-
Totals		3,360.6	1,339,104	110,205	23,097	472,406	129.1	1,906.8	1.9
									\$ 3,485

NOTE: Sections 21, 22, 23, 27, 16 and 26 worked by Camp 1,  
Sections 31 and 33 worked by Camp 2.



029



TABLE NO. 2

RESULTS OF ERADICATION BY TYPES  
(Both Camps)

Eradication Type	Acres In Type	Ribes Eradicated			Ave. No. Ribes Per Acre	Man- days	Acres Per Man- day	Cost Per Type	Cost Per Acre	% of Total Cost	% of Total Area	% of Total Ribes
		R. Roezli	R. neved.	R. inerm								
SP-YP-Fir*	2,940.4	238,545	53,975	23	292,542	99.5	1,222.0	\$ 8,168.34	\$2.78	64.0	80.3	61.9
SP-YP-Fir-CO	414.2	41,938	1,879	-	43,817	105.8	115.3	770.65	1.86	6.1	11.3	9.3
Brush	53.0	21,143	231	-	21,374	403.3	95.4	637.95	12.04	5.0	1.5	4.5
Stream**	253.0	37,478	54,120	23,075	114,673	453.2	476.1	3,182.11	13.58	24.9	6.9	24.3
Totals Including Ribes Free	3,660.6	339,104	110,205	23,097	472,406	129.1	1,908.8	\$12,759.05	\$3.485	100	100	100
Totals Excluding Ribes Free	3,289.6	339,104	110,205	23,097	472,406	143.6	1,905.6	\$12,737.36	\$3.87	-	-	-

\*Includes 371 acres of SP-YP-Fir type blocked out as Ribes free in 3,2 man-days at a cost of \$0.06 per acre.

\*\*167.8 acres of stream type were re-worked.

Fifty man-days more required (3.4 acres per man-day).

14.7 Ribes per acre were found on the second eradication.



RECEIVED BY THE DIRECTOR OF THE BUREAU OF THE ARMY (1907)

RECORDED - 80000  
INDEXED - 80000



TABLE NO. 3

RESULTS OF ERADICATION BY CLASSES  
(Both Camps)

Eradication Class	Acres In Class	Ribes Eradicated			Ave. No. Ribes Per Acre	Man-days	Acres Per Man-day	Cost Per Acre	% of Total Cost	% of Total Area	% of Total Ribes
		R. Roezli	R. nevad.	R. incerne							
A*	937.6	1,900	775	-	2,675	29.1	32.2	\$ 193.94	\$ 0.20	1.5	25.6
B	845.9	22,082	4,781	-	26,863	31.8	5.4	1,038.59	1.23	8.2	23.1
C	1,133.3	113,547	21,637	6	135,250	114.3	1.9	4,071.41	3.44	31.9	32.3
D	693.8	201,575	82,952	23,091	307,618	443.4	0.6	7,455.11	10.75	58.4	19.0
Totals Including Ribes Free Area	3,660.6	339,104	110,205	23,097	472,406	129.1	1.9	\$12,759.05	\$ 3,485.100	100	100
Totals Excluding Ribes Free Area	3,289.6	339,104	110,205	23,097	472,406	143.6	1.7	\$12,737.36	\$ 3.87	-	-

\*Excluding 371 acres of Ribes free area the cost of class A is \$0.34 per acre.



(304, 5456)

RECEIVED AT NEW YORK FROM THE NEW YORK OFFICE OF THE FBI

252



TABLE NO. 4

RESULTS OF ERADICATION BY TYPES AND CLASSES  
(Both Camos)

Eradication Class	Acres In Class	Ribes Eradicated			Ave. No. Ribes per Acre	Man-days	Acres Per Man-day	Cost Per Class	Cost Per Acre	% of Total Cost	% of Total Area
		R. Roelzli	R. neved.	R. inerme							
Ribes Tree	371.0	-	-	-	-	-	3.2	\$ 21.69	\$ 0.06	0.2	10.1
A	508.5	1,758	551	-	2,309	4.5	22.8	151.83	0.30	1.2	13.9
B	530.1	19,191	4,049	-	23,240	40.1	120.3	803.82	1.39	6.3	15.8
C	1,090.2	102,994	19,566	3	122,563	112.4	558.3	3,732.02	3.42	29.2	29.8
D	390.5	114,602	29,809	19	144,430	369.9	517.4	3,458.98	8.86	27.1	10.7
Type Totals	2,940.4	238,545	53,975	22	292,542	99.5	1,222.0	\$3,168.34	\$ 2.78	64.0	80.3
SP-YF-Fir-Cutover Type											
A	58.0	142	224	-	366	6.3	3.1	20.41	0.35	0.2	1.6
B	265.8	2,891	733	-	3,623	13.6	35.1	234.77	0.88	1.8	7.2
C	59.5	9,141	432	-	9,573	160.9	33.4	223.28	3.75	1.7	1.7
D	30.9	29,763	491	-	30,255	979.1	43.7	292.18	9.46	2.3	0.8
Type Totals	414.2	41,938	1,879	-	43,817	105.8	115.3	\$ 770.65	\$ 1.86	6.1	11.3
Brush Type											
A	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-
D	53.0	21,143	231	-	21,374	403.3	95.4	\$ 637.95	12.04	5.0	1.5
Type Totals	53.0	21,143	231	-	21,374	403.3	95.4	\$ 637.95	\$12.04	5.0	1.5
Stream Type											
A-B	-	-	-	-	-	-	-	-	-	-	-
C	35.6	1,412	1,699	3	3,114	92.7	17.4	\$ 116.11	\$ 3.45	0.9	0.9
D	219.4	36,066	52,421	23	87,487	507.1	458.7	\$ 2,060.00	13.97	24.0	6.0
Type Totals	255.0	37,478	54,120	26	90,601	600.0	476.1	\$3,182.11	\$17.42	24.9	6.9



# A. M. B. B. B.

RECAPITULATED DATA FOR THE MONTH OF JANUARY 1942  
(continued)

GENERAL INFORMATION									
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410
411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430
431	432	433	434	435	436	437	438	439	440
441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460
461	462	463	464	465	466	467	468	469	470
471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490
491	492	493	494	495	496	497	498	499	500
501	502	503	504	505	506	507	508	509	510
511	512	513	514	515	516	517	518	519	520
521	522	523	524	525	526	527	528	529	530
531	532	533	534	535	536	537	538	539	540
541	542	543	544	545	546	547	548	549	550
551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570
571	572	573	574	575	576	577	578	579	580
581	582	583	584	585	586	587	588	589	590
591	592	593	594	595	596	597	598	599	600
601	602	603	604	605	606	607	608	609	610
611	612	613	614	615	616	617	618	619	620
621	622	623	624	625	626	627	628	629	630
631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650
651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670
671	672	673	674	675	676	677	678	679	680
681	682	683	684	685	686	687	688	689	690
691	692	693	694	695	696	697	698	699	700
701	702	703	704	705	706	707	708	709	710
711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730
731	732	733	734	735	736	737	738	739	740
741	742	743	744	745	746	747	748	749	750
751	752	753	754	755	756	757	758	759	760
761	762	763	764	765	766	767	768	769	770
771	772	773	774	775	776	777	778	779	780
781	782	783	784	785	786	787	788	789	790
791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810
811	812	813	814	815	816	817	818	819	820
821	822	823	824	825	826	827	828	829	830
831	832	833	834	835	836	837	838	839	840
841	842	843	844	845	846	847	848	849	850
851	852	853	854	855	856	857	858	859	860
861	862	863	864	865	866	867	868	869	870
871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890
891	892	893	894	895	896	897	898	899	900
901	902	903	904	905	906	907	908	909	910
911	912	913	914	915	916	917	918	919	920
921	922	923	924	925	926	927	928	929	930
931	932	933	934	935	936	937	938	939	940
941	942	943	944	945	946	947	948	949	950
951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970
971	972	973	974	975	976	977	978	979	980
981	982	983	984	985	986	987	988	989	990
991	992	993	994	995	996	997	998	999	1000



TABLE NO. 5

RESULTS OF ERADICATION BY TYPES  
(Camp 1)

Eradication Type	Acres In Type	Ribes Eradicated			Ave. No. Ribes per Acre	Man-days	Acres Per Man-day	Cost per Type	Cost per Acre	% of Total Cost Area	% of Total Ribes
		R. Roezli	R. nevad.	R. inerm.							
SP-YP-Fir*	1,938.2	142,003	40,610	22	182,635	819.1	2.4	\$5,413.99	\$2.79	60.8	56.5
SP-YP-Fir-00	414.2	41,938	1,879	-	43,817	105.8	3.6	765.79	1.85	8.6	13.6
Stream	188.2	27,629	45,843	23,075	96,547	513.0	0.5	2,724.80	14.48	30.6	29.9
Totals Including Ribes Free Area	2,540.6	211,570	88,332	23,097	322,999	1,346.9	1.9	\$8,904.58	\$3.50	100	100
Totals Excluding Ribes Free Area	2,385.6	211,570	88,332	23,097	322,999	1,344.4	1.8	\$8,886.77	\$3.73	-	-

\*Includes 155 acres of SP-YP-Fir type blocked out as Ribes free in 2.5 man-days at a cost of \$0.11 per acre.



SECRET BY NOTIFICATION IS ISSUED  
(1 02353)

THE

[illegible]

There are 11,000 to 12,000 people in the world who are blind or visually impaired. In the United States, there are about 2 million people who are blind or visually impaired. In the United Kingdom, there are about 1 million people who are blind or visually impaired. In the United States, there are about 2 million people who are blind or visually impaired. In the United Kingdom, there are about 1 million people who are blind or visually impaired.



TABLE NO. 6

RESULTS OF ERADICATION BY CLASSES  
(Camp 1)

Eradication Class	Acres In Class	Ribes Eradicated			Ave. No. Ribes Per Acre	Man-days	Acres Per Man-day	Cost Per Type	Cost Per Acre	% of Total Cost	% of Total Area	% of Total Ribes
		R. Roetzli	R. nevad.	R. inerme								
A*	606.4	1,530	700	-	2,230	3.7	20.7	\$ 133.57	\$ 0.22	1.5	23.9	0.7
B	705.3	17,505	3,915	-	21,520	30.5	121.8	810.32	1.15	9.1	37.8	6.7
C	763.7	71,822	13,636	6	85,464	111.9	398.8	2,635.75	3.45	29.6	30.0	26.4
D	465.2	120,613	70,081	23,091	213,785	459.6	805.6	5,324.94	11.45	59.8	18.3	66.2
Totals Including Ribes Free Area	2,540.6	211,570	88,332	23,097	322,999	127.1	1,346.9	\$8,904.58	\$ 3.50	100	100	100
Totals Excluding Ribes Free Area	2,385.6	211,570	88,332	23,097	322,999	135.4	1,344.4	\$8,886.77	\$ 3.73	-	-	-

\*Excluding 155 acres of Ribes free area the cost of class A is \$0.26 per acre.



TABLE NO. 2

(SECRET)

EXHIBIT OF INVESTIGATION BY CIVIL RIGHTS

(5)

No.	Name	Age	Sex	Height	Weight	Complexion	Hair	Eyes	Mouth	Nose	Ears	Teeth	Skin	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger	Palm	Foot	Hand	Arm	Leg	Ankle	Instep	Heel	Sole	Arch	Ball	Toe	Nail	Finger
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TABLE NO. 7

RESULTS OF ERADICATION BY TYPES AND CLASSES  
(Camp 1)

Eradication Class	Acres In Class	Ribes Eradicated			SP-YF-Fir Type			Acres Per Man-Per day	Cost per Type	Cost per Acre	% of Total Cost	% of Total Area
		R. Roetzli	R. nevad.	R. inerme	Total	Ribes per Ave. No.	Man-Per day					
Ribes Tree	155.0	-	-	-	-	-	2.5	62.0	\$ 17.81	\$ 0.11	0.2	6.1
A	393.4	1,388	475	-	1,864	4.7	15.1	25.1	97.95	0.25	1.1	15.5
B	439.5	14,714	3,183	-	17,897	40.7	86.7	5.1	569.90	1.30	6.4	17.3
C	698.5	62,143	12,788	3	74,914	107.3	352.0	1.9	2,395.33	3.43	26.9	27.5
D	251.8	63,758	24,183	19	87,960	349.3	352.8	0.7	2,333.00	9.27	26.2	9.9
Type Totals	1,938.2	142,003	40,610	22	182,635	94.2	819.1	2.4	\$5,413.99	\$ 2.79	60.8	76.3
SP-YF-Fir-Out-over Type												
A	58.0	142	224	-	366	6.3	3.1	18.7	\$ 17.81	\$ 0.30	0.2	2.3
B	265.8	2,891	732	-	3,623	13.6	35.1	7.6	231.53	0.87	2.6	10.5
C	59.5	9,141	432	-	9,573	160.9	33.4	1.8	222.61	3.74	2.5	2.3
D	30.9	29,764	491	-	30,255	979.1	43.7	0.7	293.85	9.51	3.3	1.2
Type Totals	414.2	41,938	1,879	-	43,817	105.8	115.3	3.6	\$ 765.79	\$ 1.85	8.6	16.3
Stream Type												
A	-	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
C	5.7	538	436	3	977	171.4	3.4	1.7	\$ 23.71	\$ 4.69	0.3	0.2
D	182.5	27,091	45,407	23,072	95,570	523.7	409.1	0.4	2,698.09	14.78	30.3	7.2
Type Totals	188.2	27,629	45,843	23,075	96,547	513.0	412.5	0.5	\$2,724.80	\$14.48	30.6	7.4



SECRET  
(100-442400)

IVR 104

[illegible]



TABLE NO. 8

RESULTS OF ERADICATION BY TYPES  
(Canto 2)

Eradication Type	Acres In Type	Ribes Eradicated			Ave. No. Ribes Per Acre	Man-days	Acres Per Man-day	Cost Per Type	Cost Per Acre	% of Total Cost	% of Total Area	% of Total Ribes
		R. Roszli	R. nevad.	R. inerme								
SP-YP-Fir*	1,002.2	96,542	13,365	-	109,907	403.9	2.5	\$2,763.65	\$ 2.76	71.7	89.5	73.6
Brush	53.0	21,143	231	-	21,374	403.3	0.6	655.26	12.36	17.0	4.7	14.3
Stream	64.8	9,849	8,277	-	18,126	279.7	1.0	435.56	6.72	11.3	5.8	12.1
Totals Including Ribes Free Area	1,120.0	127,534	21,873	-	149,407	331.9	2.0	\$3,854.47	\$ 3.44	100	100	100
Totals Excluding Ribes Free Area	904.0	127,534	21,873	-	149,407	165.3	1.6	\$3,850.62	\$ 4.26	-	-	-

\*Includes 216 acres of SP-YP-Fir type blocked out as Ribes free in 0.7 man-days at a cost of \$0.02 per acre.



# 2017

REPLY OF FRATERNITY BY JULY 3

(cont'd)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	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1910-11 CO. OF 1. 3000 4000 5000 6000 7000 8000 9000 10000 11000 12000 13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000 31000 32000 33000 34000 35000 36000 37000 38000 39000 40000 41000 42000 43000 44000 45000 46000 47000 48000 49000 50000 51000 52000 53000 54000 55000 56000 57000 58000 59000 60000 61000 62000 63000 64000 65000 66000 67000 68000 69000 70000 71000 72000 73000 74000 75000 76000 77000 78000 79000 80000 81000 82000 83000 84000 85000 86000 87000 88000 89000 90000 91000 92000 93000 94000 95000 96000 97000 98000 99000 100000



TABLE NO. 9

RESULTS OF ERADICATION BY CLASSES  
(Camp 2)

Eradication Class	Acres In Class	Ribes Eradicated			Ave. No. Ribes Per Acre	Man-days	Acres Per Man-day	Cost per Type	Cost per Acre	% of Total Cost	% of Total Area	% of Total Ribes	
		R. Rozzli	R. nevad.	R. inerme									
A*	331.2	370	75	-	445	1.3	8.4	39.4	\$ 57.82	\$ 0.17	1.5	29.6	0.3
B	140.6	4,477	866	-	5,343	38.0	33.6	4.2	231.27	1.64	6.0	12.5	3.6
C	419.6	41,725	8,061	-	49,786	118.7	210.3	2.0	1,441.57	3.44	37.4	37.5	33.3
D	228.6	80,962	12,871	-	93,833	410.5	309.6	0.7	2,123.81	9.29	55.1	20.4	62.8
Totals Including Ribes Free Area	1,120.0	127,534	21,873	-	149,407	133.4	561.9	2.0	\$3,854.47	\$ 3.44	100	100	100
Totals Excluding Ribes Free Area	904.0	127,534	21,873	-	149,407	165.3	561.2	1.6	\$3,850.62	\$ 4.26	-	-	-

\*Excluding 216 acres of Ribes free area the cost of class A is \$0.47 per acre.



1875

STATE OF MISSISSIPPI  
(CIVIL 8)

1.000

Station	Lat.	Long.	Alt.	Temp.	Wind	Clouds	Remarks
1.0	36° 38'	121° 12'	7100	38.5	1.5	2.1	Clear
2.0	36° 31'	121° 06'	7000	38.5	1.5	2.1	Clear
3.0	36° 23'	120° 58'	6900	38.5	1.5	2.1	Clear
4.0	36° 15'	120° 50'	6800	38.5	1.5	2.1	Clear
5.0	36° 07'	120° 42'	6700	38.5	1.5	2.1	Clear
6.0	35° 59'	120° 34'	6600	38.5	1.5	2.1	Clear
7.0	35° 51'	120° 26'	6500	38.5	1.5	2.1	Clear
8.0	35° 43'	120° 18'	6400	38.5	1.5	2.1	Clear
9.0	35° 35'	120° 10'	6300	38.5	1.5	2.1	Clear
10.0	35° 27'	120° 02'	6200	38.5	1.5	2.1	Clear



see collected for 100 TABLE NO. 10 of the results of the shooting and for 1000.

RESULTS OF ERADICATION BY TYPES AND CLASSES  
(Camp 2)

Eradication Class	Acres In Class	Ribes Eradicated			Ave. No. Ribes		Mar-Per day	Acres Per Man-day	Cost Per Type	Cost Per Acre	% of Total Cost	% of Total Area
		R. Roali	R. nevad.	R. inerme	Total	Per Acre						
Ribes Free	216.0	-	-	-	-	-	0.7	352.0	\$ 3.85	\$ 0.02	0.1	19.3
A	115.2	370	75	-	445	3.9	7.7	14.9	53.96	0.47	1.4	10.3
B	140.6	4,477	866	-	5,343	38.0	33.6	4.2	231.27	1.64	6.0	12.5
C	391.7	40,851	6,798	-	47,649	121.6	196.3	2.0	1,345.21	3.43	34.9	35.0
D	138.7	50,844	5,626	-	56,470	407.1	164.6	0.8	1,129.36	8.14	29.3	12.4
Type Totals	1,002.2	96,542	13,365	-	109,907	109.7	402.9	2.5	\$2,763.65	\$ 2.76	71.7	59.5
Brush Type												
A	-	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-	-
D	53.0	21,183	231	-	21,374	403.3	95.4	0.6	\$ 655.26	\$12.36	17.0	4.7
Type Totals	53.0	21,183	231	-	21,374	403.3	95.4	0.6	\$ 655.26	\$12.36	17.0	4.7
Stream Type												
A	-	-	-	-	-	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
C	27.9	-874	1,263	-	2,137	76.6	14.0	-2.0	\$ 96.36	\$ 3.45	2.5	3.5
D	36.9	8,975	7,014	-	15,989	433.3	49.6	0.7	339.30	9.24	8.8	3.3
Type Totals	64.8	9,849	8,277	-	18,126	279.7	63.6	1.0	\$ 435.56	\$ 6.72	11.3	5.8



# TECHNIQUES OF REPRODUCTION BY TYPESET AND CRAFT

(5)

LETTER TO

[illegible]



# B. Checking

The following two tables summarize the results of the checking work for 1929.

TABLE NO. 11  
SUMMARY OF CHECKING  
(Camp 1)

Eradication Type	Acres In Type	Acres Checked	% of Check	Ave. No. Ribes Eradicated Per Acre	No. Ribes Missed per Acre				F. L. S. Missed per Acre				% of Efficiency		
					R. Roez.	R. nevad.	R. iner.	Total	R. Roez.	R. nev.	R. iner.	Total	By No. of Missed Bushes	By Amt. Missed L. S.	
SP-YP-Fir- Ribes Free	155.0	0	0												
SP-YP-Fir	1,783.2	27.8	1.5	102.4	3.5	1.2			4.7	17.0	4.8	21.8	95.6	98.2	
SP-YP-Fir-CO	414.2	6.7	1.6	105.8	5.1	1.5			6.9	17.3	5.1	23.4	93.8	98.1	
Stream	188.2	7.0	3.7	513.0	3.7	11.4			16.5	10.8	23.7	37.0	96.9	99.2	
Totals	2,540.6	41.5	1.6	127.1	3.8	3.0			7.1	16.0	8.0	24.6	94.7	98.3	

Average feet of live stem for pulled bush 11.5.

Average feet of live stem for missed bush 3.5.







SUMMARY OF CHECKING  
(Camp 2)

Average feet live stem in pulled bush 11.5.  
Average feet live stem in missed bush 3.5.



11. 2. 1971

11. 2. 1971

11. 2. 1971

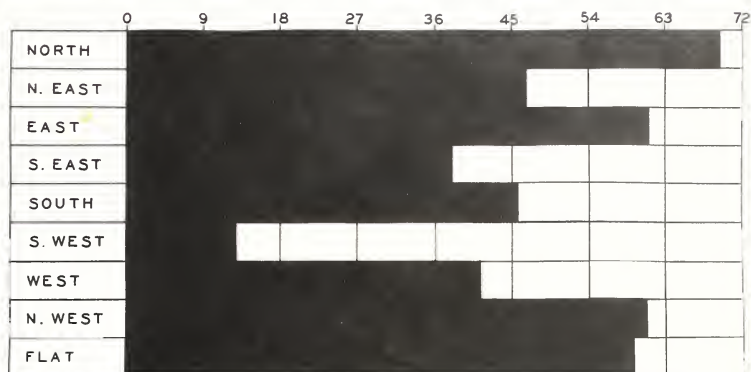
11. 2. 1971



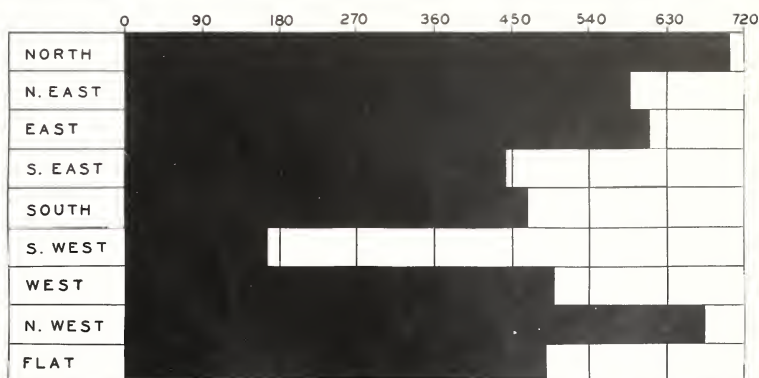
# DISTRIBUTION BY SLOPE OF RIBES ROEZLI

Meadow Valley, Plumas National Forest, California.

Number Of Bushes Per Acre



Feet Of Live-Stem Per Acre



Annual Report, 1929  
W. V. Benedict





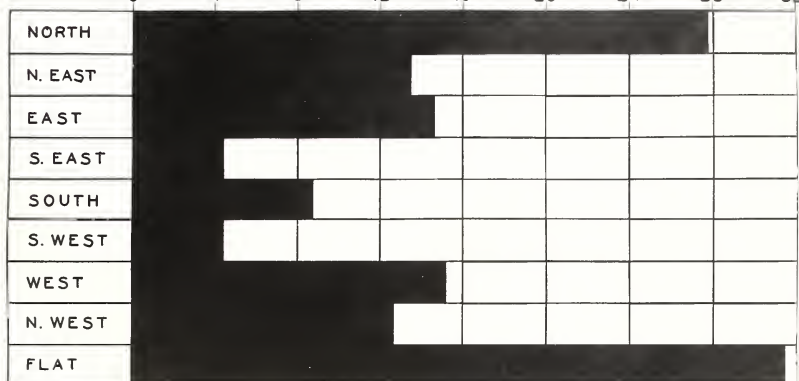


# DISTRIBUTION BY SLOPE OF RIBES NEVADENSE

Meadow Valley, Plumas National Forest, California.

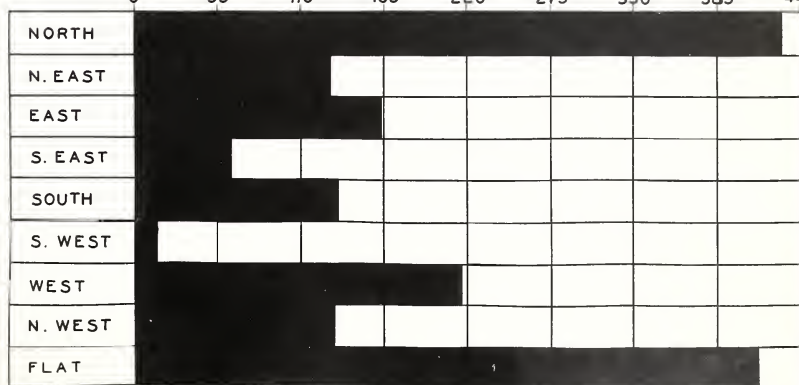
Number Of Bushes Per Acre

0 4 8 12 16 20 24 28 32



Feet Of Live-Stem Per Acre

0 55 110 165 220 275 330 385 440



Annual Report, 1929  
R. V. Benedict







### C. Pre-eradication

The pre-eradication work was done on the Rush Creek drainage (T. 26 N., R. 8 and 9 E.) of the Plumas National Forest.

The Rush Creek area constitutes the largest unbroken sugar pine stand of the Plumas Forest. It is somewhat inaccessibly located, 10 miles west of Greenville, California at an elevation of 5000-6000 feet. Timber species associated with sugar pine are white fir, red fir, Douglas fir, Jeffrey pine, lodgepole pine, yellow pine and incense cedar. White and red fir reproduction is abundant on parts of the area. Brush is heavy over much of the area, especially Ceanothus cordulatus. Ribes are abundant over the largest part of the area. The four species of Ribes present, in the order of their abundance are; R. Roezli, R. viscosissimum (hallii), R. inerme and R. nevadense.

The following table shows the results of the pre-eradication, according to eradication classes, on the 3200 acres worked:

TABLE NO. 13

#### RESULTS OF PRE-ERADICATION, RUSH CREEK

Erad- ication Class	Acres in Sec. 12	Acres in Sec. 13	Acres in Sec. 7	Acres in Sec. 18	Acres in N $\frac{1}{2}$ Sec. 19	Acres in N $\frac{1}{2}$ Sec. 26	Total Acres	% of Total
A	111.3	26.7	259.8	216.3	140.2	56.0	807.3	25.2
B	231.7	236.2	211.8	160.0	83.8	120.0	1,043.5	32.6
C	204.8	280.3	132.5	231.7	88.0	128.0	1,065.3	33.3
D	92.2	98.8	31.2	32.0	8.0	16.0	278.2	8.7
E	0	1.0	4.7	0	0	0	5.7	0.2
Total	640	640	640	640	320	320	3,200.0	100

#### COST OF OPERATION

##### A. Eradication Costs

All costs incurred by the project, properly chargeable against the field work, are included in the following table, which is the basis for all cost computations. Costs per acre for the different types and classes were figured on the basis of number of man-days of work spent on each type and class;







TABLE NO. 14

ERADICATION COSTS

Item	Camp 1		Camp 2		Both Camps	
	Amount	% of Total	Amount	% of Total	Amount	% of Total
Salaries	\$5,216.98	58.2	\$2,209.17	56.9	\$ 7,426.15	57.8
Subsistence	2,845.84	31.8	1,297.35	33.4	4,143.19	32.3
Equipment	496.08	5.6	207.58	5.3	703.66	5.5
Supplies	73.04	.8	30.55	.8	103.60	.8
Twine	73.21	.8	30.64	.8	103.85	.8
Transp. of Men	21.87	.2	9.15	.2	31.02	.2
" " Equip.	34.43	.4	14.40	.4	48.83	.4
Miscellaneous	52.11	.6	21.81	.6	73.92	.6
Pre-erad. Charges	145.19	1.6	60.75	1.6	205.94	1.6
Total	\$8,958.75	100	\$3,881.41	100	\$12,840.16	100
Minus Visitors						
Meal Deduction*	\$ 54.17		\$ 26.94		\$ 81.11	
Net Total Cost	\$8,904.58		\$3,854.47		\$12,759.05	

\*138 meals were served to Forest Service, State, Blister-Rust Officials and other visitors.

B. Checking Costs

(1) Salaries. \$176.47

(2) Meals. .... 63.34

Total \$239.81 or \$0.065 per acre.

Checking costs are included in eradication costs.

C. Pre-eradication Costs

(1) Salaries. .... \$111.33

(2) Subsistence. .... 48.64

(3) Transportation. .. 17.51

Total \$177.48 or \$0.05 per acre.



# Table 1

## ADDITIONAL COSTS

Item	Amount	% of Total	Item	Amount	% of Total
Salaries	\$2,211.98	38.3	Salaries	\$2,211.98	38.3
Subsistence	\$,884.34	15.8	Subsistence	\$,884.34	15.8
Travel	42,008.58	73.9	Travel	42,008.58	73.9
Supplies	70.04	1.2	Supplies	70.04	1.2
Trains	70.04	1.2	Trains	70.04	1.2
Transfer of Cash	31.87	.5	Transfer of Cash	31.87	.5
" " " "	31.87	.5	" " " "	31.87	.5
Miscellaneous	3.11	.0	Miscellaneous	3.11	.0
Two-way Charges	14,119.13	24.7	Two-way Charges	14,119.13	24.7
Total	\$2,882.78	100	Total	\$2,882.78	100
Home Visitors	\$ 52.17		Home Visitors	\$ 52.17	
Mail Reductions	3,000.00		Mail Reductions	3,000.00	
Net Total Cost			Net Total Cost		

### Checking Costs

(1) Salaries \$2,211.98

(2) Mail \$31.87

Total \$2,243.85 or 78.2% of total

Checking costs are included in transmission costs.

### Transmitted Costs

(1) Salaries \$2,211.98

(2) Subsistence \$,884.34

(3) Transportation \$1,786.46

Total \$4,882.78 or 100% of total



## D. Meal Costs

TABLE NO. 15

### COST OF MEALS

Item	Camo 1		Camo 2		Both Camos	
	Cost	% of Total	Cost	% of Total	Cost	% of Total
Cost of Supplies	\$2,216.20	77.9	\$ 962.55	74.2	\$3,178.75	76.7
Transp. of Supplies	31.80	1.1	13.30	1.0	45.10	1.1
Cost of Cooking	597.84	21.0	321.50	24.8	919.34	22.2
Total	\$2,845.84	100	\$1,297.35	100	\$4,143.19	100

No. Meals Served	6,387	-	2,718	-	9,105	-
Cost Per Meal	\$ 0.445	-	\$ 0.477	-	\$ 0.455	-

### CONCLUSION

The experimental Ribes eradication work on the Plumas Forest was not sufficiently extensive to provide average cost figures for the northern Sierra sugar pine region. Costs secured this year are higher than average because the eradication operation was centered in difficult working areas, and was terminated before adjoining areas, included in the original eradication program, could be worked. Pre-eradication and reconnaissance data indicate that additional eradication work would show a substantial decrease in the present per acre cost of Ribes eradication.



ADJ. 11

COST OF MEAL

Item	Camp		Camp 2		Camp 3	
	Cost	% of Total	Cost	% of Total	Cost	% of Total
Cost of Supplies	2,318.30	77.7	928.43	74.3	2,170.70	70.7
Travel & Supplies	1,130.30	37.1	1,130.30	91.1	1,130.30	37.1
Cost of Cooking	2,848.50	92.8	1,130.30	91.1	1,130.30	37.1
Total	6,297.10		2,170.70		4,431.30	
Meal Service	1,130.30		1,130.30		1,130.30	
Cost Per Meal	1,130.30		1,130.30		1,130.30	

COMMENTS

The experimental food rationation work on the island was not sufficiently extensive to provide accurate figures for the northern group and the western. Food service was not higher than average because the rationation system was not in effect in the western area, and was not in effect in the northern area. In the original rationing program, some of the rationing and reconnaissance data indicate that additional rationing work would show a substantial decrease in the present or near future on island rationation.



## ERADICATION STUDIES - WOODS AND MILL PLOTS

By

W. V. Benedict,  
Assistant Forest Pathologist.

In the spring of 1928 the California Forest Experiment Station inaugurated a comprehensive study of woods and mill operations on the Pickering Lumber Company sale area of the Stanislaus National Forest. The purpose of this study was primarily to establish a more definite correlation between the economic and silvicultural considerations involved in the management and utilization of timber stands in the California pine region.

Three contiguous 15-acre plots were established in the north-east quarter of section 28, township 4 north, range 18 east. Each plot was logged according to the following cutting practice:

Plot 1: Marked, cut and logged in accordance with standard District 5 Forest Service timber sale practice.

Plot 2: Cut and logged according to a heavy cutting system which removed merchantable material of all species to a low diameter limit.

Plot 3: Cut and logged in accordance with the practice recommended in an economic selective logging plan. This plan called for the leaving of practically all fir and cedar and the leaving of pine below a diameter limit of 30 inches.

The area on which the three plots are located was part of the area included in the experimental Ribes eradication program instituted by the Office of Blister Rust Control in 1926. An average of 30 Ribes per acre was eradicated from this area in August 1926.

### Description of Area

The woods area, within which the plots are located, is on moderately sloping ground suitable for tractor logging. The elevation is approximately 5,800 feet.

The timber type is chiefly sugar pine-fir, with some yellow pine interspersed. The stand is all aged, about 80% mature and over-mature and will cruise approximately 60,000 board feet to the acre.

Manzanita, spiny Ceanothus and scrubby chinquapin occur in considerable quantities on parts of the area where the timber stand has been opened by fire.

### Purpose of Ribes Survey

The purpose of the Ribes survey of the area was two-fold:

(1) To study the regeneration of Ribes on an area three years after the original eradication, and, (2) to study the effect of different methods of cutting and logging on Ribes establishment.



REPRODUCTION STUDIES - RIDGES AND RIBS

BY

A. V. Benedict

Assistant Forest Entomologist

In the spring of 1928 the California Forest Experiment Station inaugurated a comprehensive study of woods and mill operations on the Picketing Lumber Company's area of the Stanislaus National Forest. The purpose of this study was primarily to establish a more definite correlation between the economic and silvicultural considerations involved in the management and utilization of timber stands in the California pine region.

Three contiguous 16-acre plots were established in the north-east quarter of section 38, township 4 north, range 12 east. Each plot was logged according to the following cutting practice:

Plot 1: Marked, cut and logged in accordance with standard District 3 Forest Service timber sale practice.

Plot 2: Cut and logged according to a heavy cutting system which removed merchantable material of all species to a limit of 30 inches.

Plot 3: Cut and logged in accordance with the practice recommended in an economic selective logging plan. This plan called for the leaving of practically all fir and cedar and the leaving of pine below a diameter limit of 30 inches.

The area on which the three plots are located was part of the area included in the experimental ridge eradication program instituted by the Office of Reforestation in 1924. An average of 30 ridges per acre was eradicated from this area in August 1930.

Description of Area

The woods area, within which the plots are located, is on a moderately sloping ground and is in tractor logging. The elevation is approximately 8,800 feet.

The timber type is chiefly sugar pine-fir, with some yellow pine interspersed. The stand is all aged, about 80% mature and over-mature and will cruise approximately 60,000 board feet to the acre.

Mammals, spiny Geomys and scarpus chipmunk occur in considerable quantities on parts of the area where the timber stand has been opened by fire.

Purpose of Ridge Survey

The purpose of the ridge survey of the area was two-fold: (1) To study the regeneration of ridges on an even course years after the original eradication, and (2) to study the effect of different methods of cutting and logging on ridge establishment.



### Work Done

The locations of all Ribes on each of the three plots were recorded so they can be plotted on the detailed cover map being prepared by members of the California Forest Experiment Station (copies of which are to be furnished this office). Each Ribes was recorded, by species, according to the following classification:

Missed bushes - Ribes not found by eradication crews in 1926.

Sprouted bushes - Ribes improperly eradicated by crews.

Seedlings - New bushes.

The height and feet of live stem were taken and the Ribes carefully eradicated.

These same data were also taken on a strip two chains wide around the outside of the three plots. Ribes on this outside strip were definitely located but not eradicated. This strip was logged by the same method as the plot which it adjoins.

A permanent 5-acre check plot was established on the adjoining northwest quarter of section 27 where Ribes eradication work had not been conducted. The height and amount of live stem, by species, were taken for all Ribes on this check plot.

### Results of Work



The locations of all Ripes on each of the three plots were recorded so they can be fitted on the detailed cover map being prepared by members of the California Forest Experiment Station (copies of which are to be furnished this office). Each Ripes was recorded, by species, according to the following classification:

Missed bushes - Ripes not found by eradication crews in 1950.  
 Grounded bushes - Ripes improperly eradicated by crews.  
 Seedlings - New bushes.

The height and test of live stem were taken and the Ripes carefully eradicated.

These same data were also taken on a strip two chains wide around the outside of the three plots. Ripes on this outside strip were definitely located but not eradicated. This strip was located by the same method as the plot which it adjoins.

A permanent 5-acre check plot was established on the northwest quarter of section 37 where Ripes eradication work had not been conducted. The height and amount of live stem, by species, were taken for all Ripes on this check plot.

Results of Work



TABLE NO. 1.

## RIBES SURVEY AND ERADICATION, LOGGING AND MILL STUDY PLOTS, STANISLAUS FOREST, CALIFORNIA.

Method of Cutting and Logging	Missed Buehes				Sprouting Buehes				Seedling Buehes				Total Buehes Per Plot				Acres in Plot								
	Live Stem Per Acre	R. R.	Buehes Per Acre	Total	Live Stem Per Acre	R. R.	Buehes Per Acre	Total	Live Stem Per Acre	R. R.	Buehes Per Acre	Total	Live Stem Per Acre	R. R.	Buehes Per Acre	Total									
Plot No. 1. Forest Service	1.07	25.13	26.20	0.23	4.50	5.13	0.13	27	13.97	0	4.00	4.00	0.07	0.35	0.42	0.13	0.60	0.73	1.14	32.45	40.59	0.46	9.40	9.86	15
Plot No. 2. Guthrie Method	0.23	18.36	18.61	0.13	3.40	3.53	0.20	14.46	14.66	0.20	4.50	4.70	0.11	0.70	0.81	0.13	1.20	1.33	0.54	33.54	34.08	0.46	9.10	9.56	15
Plot No. 3. Economic Cutting Method	0.23	18.36	18.61	0.13	3.40	3.53	0.20	14.46	14.66	0.20	4.50	4.70	0.11	0.70	0.81	0.13	1.20	1.33	0.54	33.54	34.08	0.46	9.10	9.56	15
Average Total Per Acre	0.71	19.57	20.28	0.24	3.40	3.64	0.16	12.16	12.32	0.11	3.38	3.49	0.10	0.53	0.63	0.13	0.71	0.84	0.97	32.27	33.24	0.49	7.49	7.98	45

TABLE NO. 2.

## RIBES SURVEY OF A 2-CHAIN STRIP AROUND LOGGING AND MILL STUDY PLOTS.

Method	Missed Buehes				Sprouting Buehes				Seedling Buehes				Total Buehes Per Plot				Acres in Plot								
	Live Stem Per Acre	R. R.	Per Acre	Buehes Per Acre	Live Stem Per Acre	R. R.	Per Acre	Buehes Per Acre	Live Stem Per Acre	R. R.	Per Acre	Buehes Per Acre	Live Stem Per Acre	R. R.	Per Acre	Buehes Per Acre									
of Cutting and Logging	Net, R.	Per Acre	Total, R.	Per Acre	Net, R.	Per Acre	Total, R.	Per Acre	Net, R.	Per Acre	Total, R.	Per Acre	Net, R.	Per Acre	Total, R.	Per Acre	Acres								
Plot No. 1.	0.40	82.26	82.66	0.13	13.01	13.14	0.13	27	13.07	0	2.79	2.79	0	1.03	1.03	0	2.12	2.12	0.40	96.36	96.76	0.13	17.92	18.05	7.53
Forest Service	0.23	44.31	45.23	0.36	3.72	4.10	0.90	36.67	37.57	0.36	15.59	16.97	0	1.65	1.65	0	3.21	3.21	1.82	82.63	84.45	0.76	25.82	26.26	7.80
Plot No. 2.	0.23	44.31	45.23	0.36	3.72	4.10	0.90	36.67	37.57	0.36	15.59	16.97	0	1.65	1.65	0	3.21	3.21	1.82	82.63	84.45	0.76	25.82	26.26	7.80
Heavy Cutting Method	0.23	44.31	45.23	0.36	3.72	4.10	0.90	36.67	37.57	0.36	15.59	16.97	0	1.65	1.65	0	3.21	3.21	1.82	82.63	84.45	0.76	25.82	26.26	7.80
Plot No. 3.	0.23	44.31	45.23	0.36	3.72	4.10	0.90	36.67	37.57	0.36	15.59	16.97	0	1.65	1.65	0	3.21	3.21	1.82	82.63	84.45	0.76	25.82	26.26	7.80
Economic Cutting Method	0.23	44.31	45.23	0.36	3.72	4.10	0.90	36.67	37.57	0.36	15.59	16.97	0	1.65	1.65	0	3.21	3.21	1.82	82.63	84.45	0.76	25.82	26.26	7.80
Average Total Per Acre	0.69	50.47	51.36	0.36	6.77	7.13	0.36	24.31	24.67	0.15	8.90	9.05	0.03	1.09	1.12	0.05	2.17	2.22	1.28	72.88	74.16	0.57	17.85	18.42	19.33

\*A patch of missed buehes on an old burn - apparently overlooked in the original eradication.

\*\*A patch of sprouting buehes; a wet slope where conditions for Ribes growth are ideal.

A heavy original stand of Ribes populated this area (a patch about 2 ch. sq.).

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TABLE NO. 3.

## RIBES PER ACRE ON NON-ERADICATED AREA.

5-ACRE CHECK PLOT ( $NW\frac{1}{4}$  of  $NW\frac{1}{4}$  Sec.27).

Ribes Species	No. of Bushes Per Acre	Feet Live Stem Per Acre
<i>R. nevadense</i>	3.6	17.3
<i>R. roezli</i>	39.0	325.04
Total	42.6	342.34

The amount of live stem in the average bush on non-eradicated area was 8.3 feet for *R. roezli* and 4.8 feet for *R. nevadense*; and for the eradicated area 4.19 feet for *R. roezli* and 2.07 feet for *R. nevadense*.

Future Work

Periodic checks of the plots will be made to study the re-entry and establishment of Ribes. The cover map of each plot, on which will be shown the spot where each bush was eradicated, as well as the location of each bush in the two chain peripheral strip, in relation to the residual timber stand and brush patches, will materially help in making the study.



TABLE NO. 2.

KIBES LAKE WOOD ON NON-INDICATED AREA.  
2-ACRE CHECK PLOT (W $\frac{1}{2}$  of W $\frac{1}{2}$  Sec. 27).

Species	No. of Stems	No. of Live Stems
<i>R. nevadense</i>	8.2	17.5
<i>R. roosei</i>	5.0	10.0
Total	13.2	27.5

The amount of live stems in the average stand on non-indicated area was 8.3 feet for *R. roosei* and 4.8 feet for *R. nevadense*; the indicated area 4.19 feet for *R. roosei* and 1.75 feet for *R. nevadense*.

future work

Periodic checks of the plots will be made to study the re-  
entry and establishment of alders. The cover of each plot, on which  
will be shown the spot where each tree was measured, as well as the  
location of each bush in the two circles, will be noted, in relation  
to the residual timber stand and brush patches, with material help in  
making the study.



## FURTHER PROGRESS IN THE DEVELOPMENT OF RIBICIDES

By

H. R. Offord, Agent

### INTRODUCTION

The rapid spread of white pine blister rust in the pine regions of north Idaho, as determined by the Office of Blister Rust Control in the fall of 1928, showed the necessity of immediate eradication of susceptible *Ribes* which occur in close proximity to valuable white pine. More specifically, the rapid spread of the rust in Idaho called for the economic and effective eradication of *Ribes petiolare* and *Crossularia inermis*, the two most susceptible species growing in moist bottom lands throughout the range of white pine. The appearance of the rust on *Ribes* in the southern part of the pine stands was strong evidence that the rust was generally distributed over the white pine region of the Inland Empire. It seemed advisable, therefore, to apply methods of local control in those regions where most effective work could be done. Pursuant to these facts, plans were formulated for the eradication of large areas of *R. petiolare* occurring in the southern half of the white pine area of Idaho. For this work it was planned to use methods of chemical eradication which experimental studies of several years' duration had proved to be more effective and less costly than hand eradication. At the same time it was recognized that, as the work progressed northward, large areas of *G. inermis* would be encountered, the eradication of which would be extremely costly were it to be done by hand. As yet no suitable Ribicide had been devised for *G. inermis*.

The successful eradication of *G. inermis*, therefore, presented the key problem in the program of local control for the Idaho pine regions.

During the winter of 1928-29 a concerted drive along investigative lines was organized at the University of California, having as its immediate objective the development of a suitable Ribicide for *G. inermis*. Morphological work was undertaken by F. A. Patty with Mrs. Webber, Assistant in the Department of Botany, devoting part time to his assistance. A. S. Crafts, Assistant in the Division of Pomology, was secured for investigative work dealing specifically with the mechanism of the translocation of toxic chemicals by *Ribes* plants. The scope of the chemical work was increased with the aid of R. P. d'Urbal, G. R. Van Atta and N. T. Mirov as assistants. The combined program of chemical, morphological and physiological research was outlined in the writer's annual report for 1928. This report summarizes the work done in the laboratory during 1928-29, reports on 1929 field work in Idaho, California and Oregon, and tentatively outlines the research work to be undertaken in 1929-30.







Titration curves of tannin extracts of R. petiolare and G. inermis with N hydrochloric acid and N sodium hydroxide showed that tannins contributed but little to the buffer system of the plant on the acid side and only slightly more on the alkaline side. Water extracts made from dried leaves and stems of Ribes were studied as precipitants of a large number of spray solutions that had been tested out previously in the field. In general, those chemicals which had proved to be most effective under field conditions gave smaller precipitates with the water extractives than the non-effective chemicals. A study of heavy metal complexes (which did not form precipitates with Ribes water extractives) was undertaken, and as a result several new compounds were developed, which, under greenhouse conditions, proved to be very effective on G. inermis and R. lacustre. Of the compounds tested copper cyanide tetrasodiumthiosulphate gave by far the best results. Commercial methods were worked out for the manufacture of the new complex (heretofore designated as X). Glycerine, glucose and refuse molasses were established as spreaders and binders of the complex. Studies of the buffer action and dissociation constant of the complex were pursued as a guide to further research in the field of complex salts of heavy metals.

Careful experiments in which the stems and soil surface of pots were protected showed that sodium chlorate was present in the stems after 2-6 hours and in the roots in 5-7 days following application of spray. Tests were made colorimetrically with indigo sulphate and urine, following extraction of the sodium chlorate from the plant tissue by a special method of dialysis. These experiments prove conclusively that sodium chlorate, as such, moves within the tissue of the plant. These tests were made on G. roezli, R. viscosissimum and R. petiolare.

Ignition temperatures of dry Ribes leaves previously sprayed with sodium chlorate ranged from 140 to 270 deg. C. Tests were performed in air dried by passing through sulphuric acid. Spontaneous combustion of cloth soaked in chlorate occurred at 121 deg. C.

Experiments in waterproofing and fireproofing cloth to render the cloth less inflammable established a combined process involving the application of stannic oxide to the fibre and precipitation of gilsonite as a waterproofing substance with the aid of benzene as a carrier.

A study of the toxicity of the various chlorates when applied to Ribes in the greenhouse arranged the chlorates in a descending order of effectiveness given as follows: magnesium, sodium, iron, calcium barium. Magnesium chloride was suggested as a hygroscopic agent superior to calcium chloride on the basis of increased toxicity. This suggestion was withdrawn at the end of the field season after experiments showed that the magnesium mixture was much more unstable than the calcium and as a result more susceptible to spontaneous combustion.



Titration curves of tannin extracts of *A. ligularis* and *A. latifolia* with N hydrochloric acid and N sodium hydroxide showed that tannins were distributed but little to the buffer system of the plant on the one side and only slightly more on the alkaline side. Tannins were made from dried leaves and stems of Ribes were subjected to precipitation of a large number of spray solutions that had been tested and proved to be in the field. In general, those chemicals which were most effective under field conditions gave a slight precipitation with the water extractives than the non-effective chemicals. A study of heavy metal complexes (which did not form precipitates with Ribes water extractives) was undertaken, and as a result several new compounds were developed, which, under greenhouse conditions, proved to be very effective on *A. ligularis* and *A. latifolia*. Of the compounds tested copper cyanide tetrahydroborate gave the best results. Commercial methods were used for the determination of the new complex (heterocyclic borate) and it was found that the Ribes water extractives were established as a complex of the Ribes water extractives. Studies of the buffer action and its relation to the complex were turned as a guide to further research in the field of complex salts of heavy metals.

Careful experiments in which the stems and leaves of Ribes were protected showed that sodium chlorate was present in the stems after 2-3 hours and in the roots in 5-7 days following application of spray. Tests were made colorimetrically with indigo carmine and uric acid, following extraction of the sodium chlorate from the plant tissues by a special method of analysis. These experiments prove conclusively that sodium chlorate, as such, moves within the tissue of the plant. These tests were made on *A. rosei*, *A. viscosissima* and *A. petiolata*.

Ignition temperatures of dry Ribes leaves, twigs, stems, and roots were determined. Tests were made in air dried by passing through a 100°C. oven. Combustion of cloth soaked in chlorate occurred at 140 deg. C.

Experiments in water-soaking and fireproofing cloth to render the cloth less inflammable established a combined process involving the application of tannic acid to the Ribes and precipitation of aluminum as a waterproofing substance with the aid of borax as a carrier.

A study of the toxicity of the various chlorates was made. In the greenhouse arranged the chlorates in a descending order of effectiveness given as follows: magnesium, sodium, iron, sodium bicarbonate. Magnesium chlorate was suggested as a hydrochloric acid solution to calcium chloride on the basis of increased toxicity. The suggested was withdrawn at the end of the field season after experiment showed that the magnesium chloride was much more toxic than the sodium and as a result more susceptible to spontaneous combustion.



## SUMMARY OF RESEARCH WORK, 1928-1929

### Propagation of Ribes Under Greenhouse Conditions.

Seedlings and stem cuttings of R. petiolare, R. lacustre, G. inermis and R. viscosissimum were placed in flat boxes containing river sand and kept in a cool place out of doors for a period of two weeks. After this period of hardening, seedlings and stem cuttings showed new roots and were ready for the greenhouse. Sand and water cultures were used for both stem cuttings and seedlings. Half and quarter Hoagland nutrient solutions were used for the water cultures and quarter Hoagland was added to Oakley Blow, a special California sand, for sand culture propagation. R. petiolare made particularly good growth on the quarter strength water cultures. Sand culture material grew slowly but appeared normal in every respect. Overhead artificial illumination was commenced on the first of December and continued for the next three months. The additional light was given over the period 5:00 p.m. to 11:00 p.m. Both sand and water cultures responded quickly to the increased illumination. Red spider and mildew continue to be the chief greenhouse pests, best control of the former being accomplished by naphthalene fumigation and of the latter by application of sulphur on warm, bright days. Ants and the associated mealy bug were checked satisfactorily by a judicious handling of small cans of the commercial ant poison. Considerable Ribes material that had been placed in cold storage (0 degree C. room) September 15 was started on water culture in the greenhouse about the middle of January with very satisfactory results.

The result of the past season's greenhouse experience was to further enhance the water culture as a medium for the propagation of Ribes under greenhouse conditions. Ease of handling, economy of space, and more satisfactory growth are apparent in the case of the water culture method. Experience also showed (1) the advisability of increasing the length of the short dark days by artificial illumination; (2) the importance of keeping the temperature of the nutrient solution about 18 degrees C.; (3) desirability of excluding light from the culture jars; (4) the necessity for proper aeration of the nutrient solutions. For next winter's work it is planned to control more completely the above-mentioned points.

### Chemical Work.

Proximate analysis of leaves and stems of Idaho Ribes gathered in early May and pickled in alcohol was completed. Differences were observed in tannin, reducing sugar, suberin-cutin, and lignin content of the leaves and stems of the four Ribes. Samples of dried leaves of G. inermis and R. petiolare collected late in the fall showed a higher tannin content than the spring collection in the case of R. petiolare and an equal amount in the case of G. inermis. Wilson and Kern's method gave about half the amount of tannin given by The Official Method.



Propagation of Ribes Under Greenhouse Conditions

Seedlings and stem cuttings of *R. petiolaris*, *R. cereum*, *R. fruticosum* and *R. viscosissimum* were placed in first boxes in February and kept in a cool place out of doors for a period of two weeks. After this period of hardening, seedlings and stem cuttings showed new roots and were ready for the greenhouse. Both seed and cuttings were used for both stem cuttings and seedlings. Both water and nutrient solutions were used for the water cuttings and nutrient solution was added to the water cuttings. *R. petiolaris* made particularly good growth on the nutrient solution water cuttings. *R. cereum* material grew slowly but appeared normal in every respect. *R. fruticosum* artificial illumination was commenced on the first of December and continued for the next three months. The additional light was given over the period 5:00 p.m. to 11:00 p.m. Both seed and water cuttings responded quickly to the increased illumination. The speedier and more continuous to be the case greenhouse growth, best control of the former being accompanied by regular fertilization and of the latter by application of sulphur on water, bright light and heat. Associated mainly but were checked with the latter. Considerable attention was given to the commercial and policy. Considerable attention was given to the necessity for proper retention of the nutrient solution. For next winter's work it is planned to control more completely the above mentioned points.

The result of the present season's greenhouse experiments was to further enhance the water culture as a medium for the propagation of Ribes under greenhouse conditions. Ease of handling, economy of space, and more satisfactory growth are apparent in the case of the water culture method. Experiments also showed (1) the advisability of increasing the length of the short dark days by artificial illumination; (2) the importance of keeping the temperature of the nutrient solution constant; (3) the advisability of excluding light from the cuttings; (4) the necessity for proper retention of the nutrient solution. For next winter's work it is planned to control more completely the above mentioned points.

Chemical Work

Proximate analysis of leaves and stems of Idaho Ribes collected in early May and dried in alcohol was completed. Differences were observed in tannin, reducing sugar, and lignin content of the leaves and stems of the four Ribes. Samples of dried leaves of *R. fruticosum* collected late in the fall showed a higher tannin content than the spring collection in the case of *R. petiolaris* and *R. cereum*. In the case of *R. fruticosum* and *R. cereum* the amount of tannin given by the Official method gave about half the amount of tannin given by the Official method.



Galvanized spraying equipment is satisfactorily protected from the slightly corrosive action of the X sprays by applying a coat of asphalten paint thinned with benzene.

### Physiological Work.

Examination of plots at Leland Meadow showed diminution of stored starch of sprayed *R. nevadense* and *G. roezli*. Cutting *Ribes* stem under eosin solutions showed rather a large water deficit as indicated by a rapid downward movement of eosin.

Experiments performed with cut stems of *Ribes* (*R. glutinosum* and *G. leptosma* gathered from Berkeley hills) showed that gooseberries were probably more susceptible than currants when chlorate is taken in through the xylem. *G. leptosma* was injured by 1% and 2% solutions of sodium chlorate. Sufficient chlorate was absorbed by both currant and gooseberry in 15 minutes from a 12½% solution of chlorate to kill the old leaves. After 40 hours all cut shoots were killed. Cut morning glory shoots absorbed .05% of their green weight in 15 minutes, a quantity sufficient to kill. *Ribes* were affected somewhat quicker than this.

A comparison was made of the toxic action of sodium chlorate and arsenious oxide on *Ribes* and morning glory. Chlorate was found to be just as toxic as arsenic when introduced into the xylem elements. Chlorate injured the young tissue more slowly than the old tissue and killed both leaves and stems with a minimum of discoloration of the tissue. On the other hand, arsenic killed the old and young leaves with equal facility, turned the leaves quite brown, and allowed the stems to remain green except for the longest exposures.

Plasmolysis experiments were undertaken using *Tradescantia* cells, in which a comparison was made of isotonic solutions of sugar (.20 - .25 M), potassium nitrate (.12 - .16 M), and sodium chlorate (.08 - .12 M). Cells immersed in sugar and sodium chlorate showed little recovery. In nitrate solutions cells started to recover after 7 hours. Sodium chlorate showed injury in .08 M or greater after 2½ hours by the outward diffusion of the cell contents. Further studies on *Tradescantia* showed that sodium chlorate has a low coefficient of permeability with respect to protoplasm, an observation born out by the work with *Nitella*. The toxicity of sodium chlorate, sugar and arsenious oxide was then studied in the light of permeability coefficients. *Tradescantia* cells slightly plasmolysed by sugar recovered in a few days. Arsenic browned the nuclei after 24 hours, precipitated the protoplasm and rendered the cells more permeable as shown by subsequent plasmolysis with sugar solutions. Sodium chlorate browned the nuclei after 30-36 hours, coagulated with protoplasm and the plasmolysis allowed no recovery on the part of the treated cells.



Salvaged equipment is available for use in the laboratory. The equipment is available for use in the laboratory. The equipment is available for use in the laboratory.

## Physiological work.

Examination of plots at Belmont showed a marked difference in the growth of *G. leytanensis* and *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*.

Experiments performed with cuttings of *G. leytanensis* and *G. rostrata* showed that *G. leytanensis* was more susceptible to sodium chloride than *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*.

A comparison was made of the leaf area of *G. leytanensis* and *G. rostrata*. The leaf area of *G. leytanensis* was smaller than that of *G. rostrata*. The leaf area of *G. leytanensis* was smaller than that of *G. rostrata*.

Experiments were made with *G. leytanensis* and *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*. The growth of *G. leytanensis* was slower than that of *G. rostrata*.



A study of the acid injury of leaves of G. inermis and R. petiolare indicated that R. petiolare was more susceptible to acid injury than G. inermis and that in both cases penetration took place through the lower leaf surface quicker than through the upper leaf surface. Acid injury showed diffusion across thinly cutinized leaf portions or across breaks in leaf cuticle. Further studies of the penetration of acid, alkali and neutral color reagents, and sodium chlorate, into Ribes leaves confirmed the observation that penetration occurred across thinly cutinized portions of the leaf. The variability of individual plants of the different species was illustrated conclusively. It was also observed that the constituents of the leaves were able to remove quantities of the chemical involved in the penetration.

The importance of the so-called water extractives had been pointed out by chemical experiments and further physiological experiments were conducted with this point in mind. Dekkers experiments with tin foil and gelatin-covered leaves were repeated, using several sets of leaves from different positions on a number of plants. After 48 hours under artificial illumination the leaves were stained in bichromate solution and in every case the gelatin-covered and uncovered leaves were darker (showing the presence of more tannins) than the tin-foil-covered leaves.

A confirmation of the chemical theory of the importance of the extractives and their power of precipitating simple salts was obtained in the following experiment. The petioles of R. petiolare and G. inermis were cut and the ends allowed to dip into solutions of silver nitrate and a complex of silver nitrate and sodium thiosulphate. After a few hours the leaves were cleared with chloral hydrate and alcohol and placed in a developer. The complex solution allowed an even distribution through all small veins while the silver nitrate penetrated only half way along the main ribs. The same observation was made with the complex X when hydrogen sulphide was used to precipitate the copper "in situ". Starch was not depleted by dipping cut shoots of Ribes in chlorate solutions but the tannins showed a decrease as suggested by staining reaction with potassium dichromate.

Eosin solutions were used to follow the movement of water through the leaves of R. petiolare and G. inermis, and showed rapid movement through the xylem to the part of the plant where it is called by reason of the transpiration gradient.

A study of the toxicity made by placing cut stems in solutions of complex showed that it was of the same order of magnitude as arsenic and chlorate. A number of Ribes sprayed in the median portion and having the upper and lower leaves protected from contamination by the chemical, showed injury to the upper and lower leaves after a period of three weeks. This suggested that the complex X moved slowly through the phloem tissue. Penetration of the complex X is much slower than sodium chlorate due possibly to the much larger molecule.



A study of the acid injury of leaves of *A. petiolare* and *A. thermale* indicated that *A. petiolare* was more susceptible to acid injury than *A. thermale* and that in both cases penetration took place through the lower leaf surface quicker than through the upper leaf surface. Acid injury showed different degrees of severity in different portions or across breaks in leaf cuticles. Further studies of the penetration of acid, alkali and neutral color reagents, and coloring chlorate, into Ribes leaves confirmed the observation that penetration occurred across thinly cuticized portions of the leaf. The variations of individual plants of the different species was illustrated diagrammatically. It was also observed that the constituents of the leaves were able to remove quantities of the chemical involved in the penetration.

The importance of the so-called water extractives had been pointed out by chemical experiments and further physiological experiments were conducted with this point in mind. Extract experiments with tin foil and gelatin-covered leaves were repeated, using several sets of leaves from different positions on a number of plants. After 48 hours under artificial illumination the leaves were stained in dichromate solution and in every case the gelatin-covered and uncovered leaves were darker (showing the presence of more tanning) than the tin-foil-covered leaves.

A confirmation of the chemical theory of the importance of the extractives and their power of precipitating simple salts was obtained in the following experiment. The petioles of *A. petiolare* and *A. thermale* were cut and ends allowed to dip into solutions of silver nitrate and a complex of silver nitrate and sodium nitrate. After a few hours the leaves were cleared with chloral hydrate and alcohol and placed in a desiccator. The complex solution allowed an even distribution through all small veins while the silver nitrate penetrated only half way along the main ribs. The same observation was made with the complex X when hydrogen sulphide was used to precipitate the copper in starch. Starch was not deposited by dipping cut shoots of Ribes in chlorate solution but the tanning showed a decrease as suggested by retaining reaction with potassium dichromate.

Lossin solutions were used to follow the movement of water through the leaves of *A. petiolare* and *A. thermale*. All showed rapid movement through the xylem to the part of the leaf where it is called by reason of the transpiration gradient.

A study of the toxicity made by placing cut stems in solutions of complex showed that it was of the same order of magnitude as arsenic and chlorate. A number of Ribes sprayed in the median portion and having the upper and lower leaves protected from contamination by the chemical, showed injury to the upper and lower leaves after a period of three weeks. This suggested that the complex X moved slowly through the phloem tissues. Penetration of the complex X is much slower than coloring chlorate due possibly to the much larger molecules.



## Morphological Work.

In July of 1928, leaves and stems of R. petiolare, R. lacustre, R. viscosissimum and G. inermis were collected from bushes growing on average site conditions and pickled in acetic-formalin-alcohol solution. A complete series of paraffin sections of leaves and petioles of all four species was made as well as a few sections of dormant winter buds. Leaves and stems were cut into small sections and placed in diaphanal for about a month to demineralize the tissue; embedded in paraffin; cut into sections ten microns thick; stained in Delafields Haematoxlyn and mounted on permanent slides in Canada balsam. Sudan III dissolved in alcohol and glycerine was used to differentiate the suberized and cutinized cells of the leaf epidermis. Commercial Chlorox was used to extract the coloring matter in the leaves so that the venation could be studied. Free hand sections of greenhouse Ribes were stained with potassium dichromate to study the distribution of the tannins.

Due to the fact that the material collected did not represent comparable ecological forms the differences observed may have been caused by the particular site environment in which the bush from which the sample was collected happened to be growing. There appears to be no striking difference in the structure of the four species examined which could account for a difference in susceptibility to chemical treatment. The following points were suggested by the first examination of material, however, and if subsequent examination of ecological forms confirms these differences, may have bearing on the problem; (1) a cutinized layer from six to nine microns in thickness protects the upper surface of the leaves of all species. The lower surface has a very thin layer of cuticle about one micron thick. The upper surface of R. petiolare in the shade form has very poor protection, the thickness of the cuticle being only one micron. The pore walls of the stomata are cutinized. (2) Crystals of calcium oxalate are found in the palisade cells of G. inermis while in the other species the crystals are in the spongy parenchyma. (3) The glands on the under leaf surface are distinctive for each species and the species can be determined thereby. (4) The air spaces of R. lacustre and G. inermis make up a greater part of the mesophyll below the palisade layer. On the other hand intercellular spaces of R. petiolare and R. viscosissimum are smaller and the cells of the spongy parenchyma are more compact. These conditions are to be expected, for a correlation probably exists between the frequency of the air spaces and the frequency of the stomata. R. lacustre and G. inermis have an average stomatal count of about 88 per square mm. and the other two species about 150 per square mm. (5) The vascular systems of the petiole are independent of each other after they leave the stem.

Free hand sections of leaves and stems taken from greenhouse Ribes and stained for tannins with potassium dichromate showed considerable variation of tannin between individuals as well as between species. Material which had been pickled in alcohol for some time (4 months) showed



In July of 1934 leaves and stems of *Alnus* and *Salix* were collected from places growing on the average site conditions and placed in alcohol-formalin-iodine solution. A complete series of serial sections of leaves and stems of all four species was made as well as a few sections of stems and leaves and stems were cut into small sections and placed in alcohol-formalin-iodine solution. For about a month to demonstrate the tissues, embedded in paraffin; cut into sections ten microns thick; stained in a series of fast green, fast blue, and eosin in Canada balsam. The sections were mounted on permanent slides in Canada balsam. The sections were used to differentiate the epidermis and the cortex of the leaf epidermis. Commercial Chlorox was used to extract the coloring matter in the leaves so that the venation could be studied. These hand sections of greenhouse slides were stained with potassium dichromate to study the distribution of the tannins.

Due to the fact that the material collected did not represent comparable ecological forms the differences observed may have been caused by the particular site environment in which the plants were collected. It is possible that the differences in the structure of the four species examined could account for a difference in susceptibility to chemical treatment. The following points were suggested by the first examination of the material, however, and if subsequent examination of ecological forms confirms these differences, may have bearing on the problem: (1) The cuticle layer from six to nine microns in thickness protects the upper surface of the leaves of all species. The lower surface was very thin layer of cuticle about one micron thick. The upper surface of the petiole in the same form has very poor protection, and the cuticle of the petiole being only one micron. The core cells of the stomata and cuticle. (2) Crystals of calcium oxalate are found in the palisade cells of *Alnus* while in the other species the crystals are in the spongy parenchyma. (3) The glands on the under leaf surface are distinctive for each species and the species can be determined by the (4) The air spaces of *Alnus* and *Salix* make up a greater part of the mesophyll below the palisade layer. On the other hand interspersed spaces of *Alnus* and *Salix* are smaller and the cells of the spongy parenchyma are more compact. These conditions are to be expected, for a correlation probably exists between the frequency of the air spaces and the frequency of the stomata. *Alnus* and *Salix* have an average stomatal count of about 20 per square mm. and the other two species about 150 per square mm. (5) The vascular systems of the petiole are independent of each other after they leave the stem.

Three hand sections of leaves and stems from greenhouse plants and stained for tannins with potassium dichromate showed considerable variation of tannin between individuals as well as between species. Material which had been fixed in alcohol for some time (4 months) showed



much less tannin in *R. petiolare* than in *G. inermis* and *R. lacustre*. This observation was in keeping with the chemical fact previously ascertained, in effect, that *R. petiolare* differed from the other species in the ratio of alcohol-soluble to water-soluble tannins. Fresh *Ribes* leaves taken from the plants following several cloudy days were much lower in tannin content than the field samples first tested. After two sunny days *R. lacustre* showed an increase in the amount of tannin as indicated by the dichromate staining reaction. In order to test the action of light on the production of tannins, *Ribes* were placed in a dark box for 24 and 72 hours respectively, and then compared with plants growing under artificial illumination. No great difference was observed between the quantities of tannins present in the two cases for the leaves. The stem sections of plants which had been left in the dark showed some disappearance of tannin from the pith, particularly, *R. petiolare*. *G. inermis*, judging from the intensity of the color, had more tannin following the dark box treatment. These results are at variance with results obtained by repeating Dekkers experiments which definitely showed lighter staining reactions with potassium dichromate in the case of the tin-foil-covered leaves than the gelatin-covered leaves and controls.

#### Significance of Research Work in Terms of Field Experiments.

Field experiments performed during 1924, 1925, 1926 and 1927 exhaustively explored the list of known herbicides and proved conclusively that any progress in the search for a suitable Ribicide must, perforce, result from (1) an intimate knowledge of the life and habits of the several *Ribes* with which chemical eradication was concerned and (2) the reactions of those *Ribes* to the sprays applied. Keeping these thoughts in mind the research work of the winter preceding each field season has, for the past three years, provided a basis for the field tests. Owing to the time factor involved in the securing of data from field experiments, and in consideration of the short period during which it is possible to make those tests, it has been thought advisable to interpret rather liberally the facts determined by laboratory work; in this respect many of the field experiments are still empirical. Each experiment, however, is a part of the development plan and contributes information, the sum total of which is used as a starting point for the following winter's research work.

The enlarged program of investigative work undertaken during the winter 1928-29 has contributed valuable information which has been of immediate practical value in the field. Chemical, physiological and morphological research showed that toxic compounds having certain chemical properties are translocated by the plant in natural metabolic processes, or are able to diffuse to considerable extent in plant tissue without being immediately acted upon by chemical constituents of the plant. Complex salts of heavy metals stable over a pH range of 4-10 are apparently able to move within the plant in the manner suggested.



much less tannin in *A. petiolaris* than in *A. latifolia* and *A. procumbens*. This observation was in keeping with the chemical facts previously ascertained, in effect, that *A. petiolaris* differed from the other species in the ratio of alcohol-soluble to water-soluble tannin. Fresh *Ribes* leaves taken from the plants following several cloudy days were much lower in tannin content than the field samples first tested. After two sunny days *A. latifolia* showed an increase in the amount of tannin as indicated by the dichromate staining reaction. In order to test the action of light on the production of tannin, plants were placed in a dark box for 24 and 72 hours respectively, and then compared with plants growing under artificial illumination. No great difference was observed between the quantities of tannin present in the two cases for the leaves. The stem sections of plants which had been left in the dark showed some appearance of tannin from the pit, particularly in *A. petiolaris*. *A. latifolia*, judged from the intensity of the color, had more tannin following the dark box treatment. These results are in variance with results obtained by preceding Latin experiments which definitely showed lighter staining reactions with potassium dichromate in the case of the tin-foil-covered leaves than the gelatin-covered leaves and controls.

#### Significance of research work in terms of field experiments.

Field experiments were made during 1934, 1935, 1936 and 1937 extensively explored the list of known tannins and showed conclusively that any progress in the search for a suitable *Ribes* must, therefore, result from (1) an intimate knowledge of the life habits of the several *Ribes* with which chemical extraction was concerned and (2) the reactions of those *Ribes* to the various applied-keeping these thoughts in mind the research work of the winter period in each field season was, for the past three years, provided a basis for the field tests. Owing to the time factor involved in the testing of data from field experiments, and in consideration of the short period during which it is possible to make these tests, it has been thought advisable to interpret rather liberally the facts determined by laboratory work; in this respect many of the field experiments are still equivocal. Each experiment, however, is a part of the development plan and contributes information, the sum total of which is being a satisfying basis for the following winter's research work.

The enlarged project of investigative work undertaken during the winter 1938-39 has contributed valuable information which has been of immediate practical value in the field. Chemical, physiological and morphological research showed that some compounds having certain chemical properties are transferred by the plant in natural metabolic processes, or are able to diffuse to considerable extent in plant tissues without being immediately acted upon by chemical constituents of the plant. Complex salts of heavy metals stable over a pH range of 4-10 are apparently able to move within the plant in the manner suggested.



Furthermore a shorthand method of testing the proposed Ribicide as a precipitant of tannin-like bodies gives promise of providing a barometer of toxicity. The idea is entirely new in the field of plant poisons and opens up a vista of complex salts (organic and inorganic) that had endless possibilities. Application for a public service patent covering the use of complex salts of heavy metals has been made.

A combination fireproofing and waterproofing method for textiles has been devised. This process is designed to afford protection against the spontaneous combustion of clothing worn by persons engaged in spraying chlorates and to reduce the rapidity with which cloth soaked in chlorate will burn following ignition. This process was used to treat the trousers of chemical eradicators during the past summer and was instrumental in providing a summer free from accidents.

Magnesium chlorate in place of sodium or calcium chlorate has been suggested by investigative work as well as magnesium chloride as a hygroscopic agent in place of calcium chloride. Refuse molasses and glucose syrup showed promise as stickers and binders of the complex salts of heavy metals. Glycerine is most satisfactory for this purpose but in view of its cost further search is planned. The so-called "X" and "Y" sprays listed in the 1929 spray summary for Idaho, Oregon and California are specific formulae devised from the results of laboratory work.

#### SUMMARY OF FIELD WORK

##### Results of 1928 Tests of Ribicides Applied in Idaho, California and Oregon.

Experimental plots at Senta, Idaho were checked carefully by the usual method of ocular estimate during the latter part of May and at intervals during the month of June by Haring, Crafts and the writer. Results of the recheck are tabulated in Table 1.



Furthermore a short method of testing for presence of lead in a precipitant of lead-like bodies gives promise of providing a parameter of toxicity. The idea is entirely new in the field of lead poisoning and opens up a vista of complex salts (organic and inorganic) had endless possibilities. Application for a specific service patent covering the use of complex salts of heavy metals has been made.

A combination fireproofing and waterproofing method for textiles has been devised. This process is designed to afford protection against the spontaneous combustion of clothing worn by persons and in spraying catalysts and to reduce the rapidity with which cloth soaked in catalyst will burn following ignition. This process was used to treat the trousers of chemical engineers during the past summer and was instrumental in providing a summer free from accidents.

Magnesium chloride in place of sodium or calcium chloride has been suggested by investigative work as well as magnesium chloride as a hygroscopic agent in place of calcium chloride. Ketones, alcohols and glucose syrup showed promise as solvents and binders of the complex salts of heavy metals. Glycerine is most satisfactory for this purpose but in view of its cost it is not planned. The so-called "X" and "Y" sprays listed in the 1932 spray summary for Idaho, Oregon and California are specific formulas devised for the results of laboratory work.

#### SUMMARY OF FIELD WORK

Results of 1932 tests of chemicals applied in Idaho, California and Oregon

Experimental plots at Sauer, Idaho were checked carefully by the usual method of soil estimates during the latter part of the intervals during the month of June by Sauer, Idaho and California. Results of the records are tabulated in Table I.



TABLE NO. 1  
RESULTS OF 1928 EXPERIMENTAL SPRAYING AT SANTA, IDAHO  
DATA TAKEN 1929

Date of Application	Plot Number	Chemical Used	Concentration Gals. Per Gal. (g.p.)	No of Spray Days	Average Soil Temperature 7 a.m. to 7 p.m. Temp.	At Time of Application		B. reticulata		B. leucostriata		B. intermedia		B. xizocarpus			
						Average Relative Humidity	Weather Log	Live Stems Killed Per Cent	Bushes Killed Per Cent	Live Stems Killed Per Cent	Bushes Killed Per Cent	Live Stems Killed Per Cent	Bushes Killed Per Cent	Live Stems Killed Per Cent	Bushes Killed Per Cent		
6/7/28	VI A (5-5-7)	A	2.70	6, 8	10	51	66	cloudy with wind.	0			(2)		(3)		0	
6/9/28	VI A (5-5-7)	A	3.40	6, 8	5	54	52	Warm, Clear.	0	22	31	41	58	72	82	0	
6/9/28	VI B (5-5-5)	+ Calcium chloride	2.70	9	5	54	49	Warm, Clear.	0			(3)		(3)		0	
6/9/28	VI B (5-5-5-7)	+ Calcium chloride	2.70	9	5	54	49	Warm, Clear.	0					(3)		0	
6/14/28	VI B (5-7-5)	+ Calcium chloride	3.40	9	4	51	51	Warm, Clear.	0	97	69	49	91	82	31	0	
6/14/28	VI A (5-5-5)	+ Sodium hydroxide	0.08	16	21	51	51	Warm, Clear.	0	99	89	34	96	53	77	0	
6/14/28	VI B (5-5-5)	+ Sodium hydroxide	0.08	16	21	51	51	Warm, Clear.	0	99	89	34	96	53	77	0	
6/15/28	VI A (4-5-5)	+ Manganese chloride	3.40	6, 8	5	55	72	cloudy with wind.	0	100	100	41	99	97	31	0	
6/25/28	VI A (4-5-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	0	46	4	48	87	15	55	0	
6/26/28	VI B (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	0	46	4	48	87	15	55	0	
6/26/28	VI B (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
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6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100	100	4	95	63	99	83	43	65
6/26/28	VI A (4-5)	+ Sodium hypochlorite	4 strength	6	28	57	57	Warm and cloudy.	100</								

(1) Symbol for sodium chlorate.

(2) Concentration of chemical expressed in this report as pounds per gallon instead of per cent by weight as in 1928 report.

(3) Plots burned over in fall of 1928 by men clearing brush







TABLE NO. 1 (Continued)  
RESULTS OF 1928 EXPERIMENTAL TREATING AT SANTA, IDAHO  
DATA TAKEN IN 1928

Date of Application	Plot Number	Chemical Used	Concentration Lbs. Per Gal. 80 (2)	pH of Spray (2)	At the Time of Application			B. petiolare			B. lacustris			G. inermis		
					Average Soil Temperature 7 a.m. to 7 p.m. in Deg. F.	Average Relative Humidity 7 a.m. to 7 p.m.	Weather Log	Live Stems Filled Per Cent	Bushes Filled Per Cent	Bushes Treated Number	Live Stems Filled Per Cent	Bushes Filled Per Cent	Bushes Treated Number	Live Stems Filled Per Cent	Bushes Filled Per Cent	Bushes Treated Number
8/5/28	III B (0-1)	A (1) + Phenol	0.40 0.008	8	58		Warm, Clear.	0		0	0	80	34	113		
8/5/28	IV A (3-4)	+ Sodium tetraborate	1.40 0.42	5, 5	58		Warm, Clear.	0		100	100	1	66	10	73	
8/5/28	IV A (2-3)	+ Sodium tetraborate	2.70 0.42	7	58		Warm, Clear.	0		100	100	1	47	24	119	
8/5/28	III B (1-1.3)	+ Sodium tetraborate	0.16	8	58		Warm, Clear.	0		0	76	50	0	66	39	38
8/7/28	III B (1-1.3)	Parformal	1.40	6, 8	57		Warm, Clear.	100	100	12	100	7	0	0	0	0
8/7/28	Ex. 3	A	2.00	6, 8	57		Warm, Clear.	100	100	7	0	0	0	0	0	0
8/7/28	Ex. 4	+ Sodium dichromate	1.40	1.5	57		Warm, Clear.	100	100	6	0	0	0	0	0	0
8/7/28	Ex. 5	+ Sodium dichromate	1.40 0.42	1.5	58		Warm, Clear.	100	100	10	0	0	0	0	0	0
8/8/28	Ex. 6	+ Potassium permanganate	0.16	1.5	58		Warm, Clear.	100	100	7	0	0	0	0	0	0
8/8/28	Ex. 7	+ Potassium permanganate	0.42	2	58		Warm, Clear.	38	90	10	0	0	0	0	0	0
8/8/28	Ex. 8	+ Ammonium chloride	2.00 0.89	5	1.5	58	Warm, Clear.	100	100	6	0	0	0	0	0	0
8/8/28	Ex. 9	+ Ammonium chloride	0.42	5	2	58	Warm, Clear.	100	100	7	0	0	0	0	0	0
8/8/28	Ex. 10	Parformal	0.42	5	58		Warm, Clear.	2	0	12	0	0	0	0	0	0
8/8/28	II A (1-2)	Phenol	0.42	5	58		Warm, Clear.	0	7	0	7	0	2	10	0	144
8/8/28	II A (2-3)	Phenol	0.42	5	58		Warm, Cloudy	0	47	3	0	0	2	10	0	144
8/14/28	VIII A (0-1)	+ Calcium chloride	2.70 1.40	6, 8	5, 5	58	Warm, Cloudy	0			Data to be taken 1930			Data to be taken 1930		
8/14/28	VIII A (1-2)	+ Calcium chloride	2.70 0.89	6, 8	7	55	Warm, Cloudy	0			Data to be taken 1930			Data to be taken 1930		
8/14/28	VIII A (2-3)	+ Calcium chloride	2.00 0.89	6, 8	5	55	Warm, Cloudy	0		99	0	1	56	23	74	
8/14/28	VIII A (3-4)	A	1.40	6, 8	5	55	First frost in early a.m. Warm, Cloudy	92	96	20	0	0	75	23	64	
8/16/28	Ex. 11	A	0.82	8	51		Warm, Clear.	98	94	20	0	0	0	0	0	0
8/16/28	Ex. 12	A	0.89	12	7	51	Warm, Clear.	98	94	20	0	0	0	0	0	0
8/17/28	Ex. 13	A	2.70	6, 8	5	51	Warm, Clear.	0		0	0	0	80	40	15	
8/17/28	Ex. 14	A	0.82	6, 8	5	50	Warm, Clear.	100	100	12	0	0	0	0	0	0
8/17/28	Ex. 15	A	0.42	6, 8	5	50	Warm, Clear.	92	90	10	0	0	0	0	0	0
8/17/28	Ex. 16	Potassium chlorate	0.42	2	5	50	Warm, Clear.	97	82	6	45	30	12	25	0	5
8/17/28	Ex. 17	Potassium chlorate	0.42	2	4	50	Warm, Clear.	92	80	5	40	10	10	0	0	0
8/17/28	VIII A (4-5)	A	3.40	2	5	52	Warm, Clear.	0		84	29	7	57	24	101	
8/17/28	Ex. 18	A	2.00	2	1.5	52	Warm, Clear.	100	100	4	0	0	0	0	0	0
8/20/28	VIII A (5-5.5)	A	2.40	10	5	51	Warm, Clear.	0		0	0	71	27	71		
8/20/28	VIII A (5-5.5)	A	2.00	3	4.5	51	Warm, Clear.	0		0	0	48	10	49		
8/20/28	VIII A (5-5.5)	A	2.00	13	6, 8	51	Warm, Clear.	0		56	0	1	29	16	86	
8/20/28	VIII B (0-1)	A	1.40	2	6, 5	54	Warm, Clear.	0		0	0	45	5	153		
8/22/28	VIII B (1-1.5)	A	1.40	10	5	54	Warm, Clear.	0		0	0	47	6	38		
8/22/28	VIII B (1.5-2)	+ Calcium chloride	2.70 0.89	2	5	54	Warm, Clear.	0		0	0	64	25	35		
8/22/28	VIII B (2-3)	+ Calcium chloride	2.70 0.89	10	5	55	Warm, Cloudy	0		0	0	71	21	82		
8/22/28	VIII B (3-4)	+ Calcium chloride	2.70 0.89	10	6, 5	55	Warm, Cloudy	0		0	0	56	19	61		
8/22/28	VIII B (4-5)	+ Calcium chloride	2.70 0.89	2	5	55	Warm, Cloudy	0		0	0	62	21	66		
8/24/28	VIII B (5-6)	+ Ammonium chloride	2.70 0.16	12	7	56	Warm, Cloudy	0		0	0	72	32	78		
8/24/28	VIII B (6-6.5)	+ Ammonium chloride	2.70 0.16	7	6, 5	55	Cool, Cloudy in a.m. Rain in p.m.	0		0	0	78	52	61		
8/27/28	IX A (0-1)	+ Ammonium chloride	2.70 0.16	2	5	54	Cool, Frequent showers.	0		0	0	71	32	40		
8/27/28	IX A (1-1)	+ Ammonium chloride	2.70 0.42	12	5, 5	54	Cool, Frequent showers.	0		0	0	70	30	46		
8/27/28	IX A (1-2)	+ Ammonium chloride	0.12	7	6	54	Cool, Frequent showers.	0		85	28	4	65	29	74	
8/28/28	IX A (2-3)	+ Ammonium chloride	0.42	2	5	52	Warm, Cloudy in p.m.	0		0	0	78	36	56		
8/29/28	IX A (2-4)	+ Ammonium chloride	2.70 0.89	2	5	50	Warm, Clear.	0		0	0	68	57	68		
8/29/28	IX B (0-1)	+ Ammonium chloride	0.89	7	5	50	Warm, Clear.	0		100	100	1	79	45	87	
8/29/28	IX B (1-1)	+ Ammonium chloride	0.89	12	8	50	Warm, Clear.	0		100	100	1	75	32	110	
8/29/28	IX B (1-2)	+ Calcium chloride	2.70 1.40	10	6, 5	50	Warm, Clear.	0		78	25	4	55	13	69	
8/30/28	IX B (2-3)	+ Calcium chloride	2.70 1.40	2	5	50	Warm, Clear.	0		0	0	62	21	72		
8/30/28	IX B (10-15)	+ Perchloric acid	0.08	4, 5	52	48	Warm, Clear.	0		95	50	2	65	20	65	
8/31/28	IX B (1-2)	+ Sulfuric acid	2.70 0.08	8	5	48	Warm, Clear.	0		79	0	1	78	41	101	
8/31/28	IX B (1-2)	A	1.40	2	5	52	Warm, Clear.	100	100	12	0	0	0	0	0	0

(1) Symbol for sodium chlorate.

(2) Concentration of chemical expressed in this report as pounds per gallon instead of per cent by weight as in 1928 report.







Discussion of Idaho Work. The four best spray formulae for the destruction of G. inermis gave the following percentage kill of bushes: sodium chlorate plus manganese chloride 97%, sodium chlorate alone pH 6.8, 72%, sodium chlorate plus potassium permanganate 64%, sodium chlorate plus sodium hydroxide 59%. The results of the sodium chlorate manganese chloride mixture are probably not an exact statement of the toxicity owing to the fact that the Ribes on this particular station were small bushes, and due to the complete nature of the kill it was difficult to distinguish G. inermis from R. lacustre. This formula, however, will bear further investigation. Slight adjustments of pH from 5-8 appear to make very little difference to the toxicity of the spray. Strongly alkaline sprays or strongly acid sprays showed considerable difference, however, the alkaline sprays as previously reported being much more effective than the acid sprays. Taking into consideration the size and vigor of the Ribes to which the above sprays were applied and the general vigor of the partially killed bushes the alkaline chlorate spray stands out as the best Ribicide for G. inermis.

The same four sprays named above showed most promising results on R. lacustre, and are sufficiently toxic that they might well be recommended for field use were it not for the fire risk attached to the application of sprays containing 2.7 pounds chlorate per gallon of water. The four most effective Ribicides for R. lacustre averaged 94% kill of bushes.

One of the upsets of the 1929 season was the observed susceptibility of R. viscosissimum to chlorates. A 15% solution (1 lb. per gal. water) killed 97% of the bushes. As previously noted for R. petiolare and G. inermis, the addition of calcium chloride rendered the chlorate somewhat less toxic. Best results were obtained at pH of 6.2. The addition of ammonium chloride did not reduce the toxicity of the sodium chlorate to any great extent.

Results of rather small tests on R. petiolare of dilute solutions of chlorate with and without an additional oxidizing agent showed that solutions at pH 6.8 were quite effective. Reduction of the acidity to pH of 2, however, is not advisable. Chlorate at pH 12 showed several resprouts from the crown and some live stem not completely killed.

Chemical eradication plots located on the South Fork of the Stanislaus River, and at Island Meadow in the Stanislaus National Forest were checked during the first two weeks of June by d'Urbal and Van Atta. A summary of the spray effectiveness is given in Table 2.



Discussion of Idaho Work. The four new spray formulas for the destruction of B. thuringiensis gave the following percentage kills: 100% sodium chlorate plus manganese chloride 5%, sodium chlorate alone 75%, 75% sodium chlorate plus sodium borate 5%, sodium chlorate plus sodium borate 5%. The results of the sodium chlorate plus manganese chloride mixture are probably not as good as those of the other mixtures, but the fact that the flies on this mixture died at the rate of 100% is a very good result. The results of the sodium chlorate plus manganese chloride mixture are probably not as good as those of the other mixtures, but the fact that the flies on this mixture died at the rate of 100% is a very good result. The results of the sodium chlorate plus manganese chloride mixture are probably not as good as those of the other mixtures, but the fact that the flies on this mixture died at the rate of 100% is a very good result.

The same four sprays were also tested on B. thuringiensis on B. thuringiensis, and are sufficiently toxic that they may be recommended for field use. It is not the first time that the application of a spray containing 5% sodium chlorate has been used. The four most effective mixtures for B. thuringiensis are: 100% sodium chlorate plus manganese chloride 5%, sodium chlorate alone 75%, 75% sodium chlorate plus sodium borate 5%, sodium chlorate plus sodium borate 5%.

One of the results of the 1935 season was the discovery that the ability of B. thuringiensis to chlorate is not as good as that of B. thuringiensis. The results of the 1935 season were: 100% sodium chlorate plus manganese chloride 5%, sodium chlorate alone 75%, 75% sodium chlorate plus sodium borate 5%, sodium chlorate plus sodium borate 5%.

Results of further small tests on B. thuringiensis showed that sodium chlorate with and without sodium borate was more effective than sodium chlorate alone. The results of the 1935 season were: 100% sodium chlorate plus manganese chloride 5%, sodium chlorate alone 75%, 75% sodium chlorate plus sodium borate 5%, sodium chlorate plus sodium borate 5%.

Chemical examination of the flies located on the banks of the Stensån River, and a field test in the Stensån River, were conducted during the first two weeks of June by G. H. H. H. A summary of the spray effectiveness is given in Table 2.



TABLE NO. 2  
RESULTS OF 1928 EXPERIMENTAL SPRAYING IN CALIFORNIA  
DATA TAKEN IN 1929

Date of Application	Plot Number	Chemical Used	Concentration Lbs. Per Gal. H <sub>2</sub> O	pH of Spray	Gallons Used	At Time of Application		Weather Log	R. nevadense			S. roosei		
						Average Soil Temperature 7 a.m. to 5 p.m. Deg. F.	Average Relative Humidity 7 a.m. to 5 p.m.		Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number	Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number
6/20/28	S.F. Stanislaus I A (0-1) Area I	A (1) + Calcium chloride	2.70 2.80	9	10.5	52	55	Warm, Clear.	98	43	87			0
6/21/28	I A (1-2)	A + Calcium chloride	2.70 3.00	9	8	51	55	Warm, Clear.	96	36	95			0
6/21/28	I B (0-1)	A + Calcium chloride	2.70 2.40	9	7	51	56	Warm, Clear.	98	75	68	91	63	8
6/21/28	I B (1-2)	A + Ammonium chloride	2.70 1.50	5.6	6	51	56	Warm, Clear.	96	61	78			0
6/23/28	I B (2-3)	A + Ammonium chloride	2.70 1.60	5.6	7	54	52	Warm, Clear.	98	88	91	21	0	2
6/23/28	I A (2-3)	A + Ammonium chloride	2.70 1.80	5.6	3	54	52	Warm, Clear.	99	69	29	33	0	1
6/26/28	I A (0-1)	A + Sodium dichromate	1.40 0.42	10	54	56	Warm, Clear.	92	32	66				0
6/26/28	I B (0-1)	A + Sodium dichromate	1.40 0.42	1.5	54	56	Warm, Clear.	92	91	11				0
6/26/28	I A (2-3)	A + Sodium tetraborate	1.40 0.42	9	4	52	56	Warm, Clear.	98	81	27			0
6/26/28	I B (1-2)	A + Sodium tetraborate	1.40 0.42	9	4	52	56	Warm, Clear.	99	82	28			0
6/26/28	I B (2-3)	A + Potassium permanganate	1.40 0.42	3	52	56	Warm, Clear.	97	50	28				0
6/26/28	I A (1-1.5)	Ammonium chloride	0.89					Warm, Clear.	17	0	23	35	0	1
6/26/28	I A (1.5-1.7)	+ Sodium dichromate	0.42	5.5	4	52	56	Warm, Clear.	52	12	17			0
6/26/28	I A (1.7-2)	Ammonium chloride	1.40	5.6	5	52	56	Warm, Clear.	71	0	32			0
6/27/28	I A (0-1) Area III	Ammonium chloride	1.40	5.9	11	51	59	Cloudy at intervals				0	85	5 40
6/27/28	I A (1-1.5)	Ammonium chloride	1.40	5.8	4	51	59	Cloudy at intervals				0	81	3 31
6/27/28	I A (1.5-2)	+ Sodium dichromate	0.42	3	51	59	Cloudy at intervals				0	36	0	11
6/27/28	I B (0-1)	Sodium hypochlorite (2)	Strength	4	51	59	Cloudy at intervals	4	0	1	39	0	10	
6/27/28	I A (2-3)	Sodium hypochlorite	Strength	2	51	59	Cloudy at intervals	11	0	1	42	0	5	
6/27/28	I B (2-3)	Full Sodium hypochlorite	Strength	4	51	59	Cloudy at intervals		0	32	0	14		
6/28/28	I A (2-3)	Ammonium persulfate + Ammonium chloride	0.89 0.42	3	52	65	Cloudy at intervals		0	36	0	17		
6/28/28	I B (1-1.5)	A + Ammonium chloride	2.70 1.60	3	52	65	Cloudy at intervals		0	90	43	21		
6/28/28	I B (1.5-2)	A + Ammonium chloride	2.70 1.40	5	52	65	Cloudy at intervals		0	95	50	20		
6/29/28	I B (2-3)	A + Calcium chloride	2.70 2.80	9	5	52	56	Warm, Clear.		0	55	31	19	
6/29/28	I A (1-2)	A + Calcium chloride	2.70 2.40	9	4	52	56	Warm, Clear.		0	99	86	21	
6/29/28	I A (0-1)	A + Calcium chloride	2.70 3.00	9	5	52	56	Warm, Clear.		0	99	89		3
6/29/28	I B (0-1)	A + Ammonium chloride	2.70 1.80	5.6	1	52	56	Warm, Clear.		0	95	50		8
6/29/28	I B (1-2)	Potassium permanganate + Acetic acid	0.89 0.08	4	52	56	Warm, Clear.		0	35	3	33		
6/30/28	I A Area II (0-1)	Full Sodium hypochlorite	Strength	1	53	61	Cloudy.	52	0	7	36	0	8	
6/30/28	I B (0-1)	Sodium hypochlorite	Strength	2	53	61	Cloudy.				12	0	16	
6/30/28	I B (3-4)	Sodium dichromate	0.42	2	53	61	Cloudy.	18	0	14	11	0	3	
7/2/28	I B (6-6.5)	Potassium permanganate + Acetic acid	0.89 0.08	1	52	62	Cloudy at intervals	10	0	1				0
7/2/28	I B (4-5)	Ammonium persulfate + Acetic acid	0.89 0.16	3	52	62	Cloudy at intervals	2	0	11	33	0	7	
7/3/28	I A (1-2)	A + Calcium chloride	2.70 2.40	4.4	6	53	50	Warm, Clear.	99	83	35	45	25	4
7/3/28	I A (2-3)	A + Calcium chloride	2.70 2.80	4.4	8	53	50	Warm, Clear.	99	70	43	67	40	5
7/5/28	I A (3-4)	A + Ammonium chloride	2.70 1.60	9	3.6	53	59	Warm, Clear.	99	80	51	27	0	2
7/5/28	I A (4-5)	A + Ammonium chloride	2.70 1.80	9	6	53	59	Warm, Clear.	94	48	56	84	33	13
7/5/28	I A (5-6.5)	A + Ammonium chloride	2.70 1.50	9	1	53	59	Warm, Clear.	96	25	4			0

(1) Symbol for sodium chlorate.

(2) A commercial product. Percentage NaOCl standard.







TABLE NO. 2 (Continued)  
RESULTS OF 1928 EXPERIMENTAL SPRAYING IN CALIFORNIA  
DATA TAKEN IN 1928

Date of Application	Plot Number	Chemical Used	Concentration Lbs. Per Gal. H <sub>2</sub> O	pH of Spray	Gal- lons Used	At Time of Application		Weather Log	B. nevadense			D. rosei		
						Average Temper- ature 7 a.m. to 5 p.m.	Average Rela- tive Humid- ity 7 a.m. to 5 p.m.		Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number	Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number
7/6/28	I A (0-1)	A (1) + Ammonium chloride	2.70 1.60	4.4	6	53	49	Warm. Clear.	99	57	7	85	11	9
7/6/28	I A (1-2)	A + Ammonium chloride	2.70 1.80	4.4	7	53	49	Warm. Clear.	100	100	5	97	40	30
7/6/28	III B (1-2)	Sodium tetraborate	0.16	9	9	53	49	Warm. Clear.	0	0	1	0	0	7
7/6/28	II B (1-2)	Sodium tetraborate + Ammonium chloride	0.16 0.89	9	3	53	49	Warm. Clear.	27	0	18	50	0	2
7/9/28	II B (2-3)	Sodium hypochlorite (2) + Strength Sodium tetraborate	0.16 0.16	8					7	0	27	16	0	9
7/9/28	II B (5-5-6)	+ Potassium permanganate	0.16	3					0	0	10			0
7/9/28	II B (5-6-6)	Sodium dichromate + Sodium hydroxide	0.89 0.16	1					25	0	4			0
7/9/28	III A (0-1)	Sodium dichromate + Sulphuric acid	0.89 0.16	2.5							0	16	0	18
7/9/28	III B (0-1)	Sodium dichromate + Sodium hydroxide	0.89 0.16	2					1	0	3	6	0	16
7/11/28	III A (1-2)	Sodium tetraborate + Sulphuric acid	0.16 0.16	1	52	50	Warm. Clear.				0	28	0	7
7/11/28	I A (2-3)	A + Ammonium chloride	2.70 1.20	4.4	3	52	50	Warm. Clear.	99	75	4	84	28	14
7/11/28	I B (0-1)	A + Ammonium chloride	2.70 2.00	9	1	52	50	Warm. Clear.	100	100	2	71	40	5
7/11/28	I B (1-2)	A + Ammonium chloride	2.70 2.00	9	3	52	50	Warm. Clear.	98	33	3	94	35	14
7/11/28	I B (2-3)	A + Ammonium chloride	2.70 1.20	9	3	52	50	Warm. Clear.	99	85	14	90	11	19
7/26/28	III A (0-1)	Leland Meadow A	3.40 2.00	12	5	60	57	Warm. Clear.			0	88	59	39
7/26/28	III A (1-2)	A	2.00	12	2	60	57	Warm. Clear.			0	96	42	41
7/26/28	III A (2-3)	A	1.40	12	4	60	57	Warm. Clear.			0	92	26	15
7/27/28	III A (3-4)	A	3.40	2	4	61	59	Warm. Clear.			0	95	32	17
7/27/28	III A (4-5)	A	2.00	2	3	61	59	Warm. Clear.			0	75	26	23
7/27/28	III A (5-6)	A	1.40	2	2	61	59	Warm. Clear.			0	86		2
7/27/28	III A (5-6)	Ammonium chloride + Acetic acid	2.70 0.16	2							0	83	0	8
7/28/28	IX A (0-1)	Leland Meadow A	3.00 2.70	12	6	61	60	Warm. Clear.			0	89	65	17
7/28/28	IX A (1-2)	+ Calcium chloride	2.70	12	3.5	61	60	Warm. Clear.			0	98	38	13
7/28/28	IX B (0-1)	A + Calcium chloride	2.70 2.80	12	3	61	60	Warm. Clear.			0	54	18	17
7/28/28	IX B (1-2)	A + Furfural	2.70 0.16	7	3.5	61	60	Warm. Clear.			0	62	41	34
7/28/28	I A (0-1)	Leland Meadow A	1.40 0.08	7	5	60	57	Warm. Clear.	99	95	30			0
7/29/28	I A (1-2)	A + Furfural	0.16 0.16	7	9	60	57	Warm. Clear.	99	93	44			0
7/29/28	I A (2-3)	A + Furfural	2.70 0.08	7	3	60	57	Warm. Clear.	99	89	9			0
7/29/28	IV B (0-1)	Leland Meadow A	2.70 0.16	7	6	60	57	Warm. Clear.	99	97	31			0
7/29/28	IV B (1-1.5)	A + Sodium hydroxide	2.70 0.16	11	60	57	Warm. Clear.		99	90	39			0
7/29/28	IV B (1.5-2)	A + Sodium hydroxide	2.70 0.08	6				Warm. Clear.	99	68	16			0
7/30/28	IV A (5-7)	Furfural A	0.45 2.00	6				Warm. Clear.	29		26			0
7/30/28	IV A (5-7)	+ Ammonium chloride + Furfural	1.40 0.16	7				Warm. Clear.	100	100	30			0
7/30/28	IV A (5-7)	A + Ammonium chloride	1.00 1.20											
7/30/28	IV A (5-7)	+ Ammonium chloride + Furfural	1.00 0.04	4				Warm. Clear.	82	42	19			0
8/2/28	Manzanita and Ceanothus bushes. Western edge of meadow marked with stakes.	A	2.70	5.8	4			Warm. Clear.	100	100	2	100	100	5

(1) Symbol for sodium chloride.

(2) A commercial product. Percentage NaOCl standard.

Annual Report 1929

R. R. Offord







Discussion of California Work. Results of the application of chemicals to G. roezli do not promise a satisfactory Ribicide. G. roezli is very resistant to a large range of formulae tested by spray application, closely approximating the resistance exhibited by G. inermis in Idaho. Sodium chlorate alone, or sodium chlorate mixed with ammonium chloride or calcium chloride in acid, basic or neutral solutions gave mediocre results. 85 to 90% kill was obtained with sodium chlorate and calcium chloride on Area III, on the South Fork of Stanislaus. The bushes affected were in an open moist piece of land. On the same area G. roezli sprayed with a mixture of sodium chlorate with an intermediate concentration of calcium chloride gave only 31% kill. The latter experiment was performed on G. roezli growing in a drier location. Complete and partial kills are shown by photographs W. 840 and W. 843.

R. nevadense is much more susceptible to all chemicals than G. roezli, as reference to Table 2 shows. However, in view of d'Urbal's observation that R. nevadense frequently resprouts the second year after application the percentage of kill should not be taken as final. An excellent kill was obtained in Leland Meadow in the moist and shady southeast end of the meadow with a mixture of sodium chlorate, furfural and ammonium chloride, and, also with a mixture of sodium chlorate and furfural. These results may, in part, be attributed to the favorable conditions in the southeast corner of the meadow. A high percentage of kill (89-91) was obtained with straight sodium chlorate in another area. Furfural chlorate mixtures, however, are to be investigated further. Typical killing action on R. nevadense is illustrated by photographs W. 838 and W. 839.

In general, the action of sodium chlorate alone, on both G. roezli and R. nevadense, is more effective than mixtures of sodium chlorate with calcium chloride or with ammonium chloride in acid and alkali solutions.

Conditions of low humidity which exist for the greater part of the summer in the Sierra regions undoubtedly militate against the successful chemical eradication of Ribes. Unless a chemical can be developed which penetrates in lethal quantities before the spray dries under the existing low humidity, it may be necessary to resort to late season applications of a spray, or root applications of a hygroscopic mixture.

Chemical plots established at Still Creek and at Veda Lake, Oregon, in 1928, were rechecked in July of 1929 by d'Urbal after a preliminary examination by the writer. Data were recorded for live stem and bushes killed in the usual way and the percentage kill of live stem and bushes reported in Table 3 are given for R. bracteosum and R. lacustre.







TABLE NO. 3

RESULTS OF 1928 EXPERIMENTAL SPRAYING IN OREGON  
DATA TAKEN IN 1929

Date of Appli- cation	Plot Number	Chemical Used	Concen- tration lbs. per Gal. H <sub>2</sub> O	pH of Spray	Gal- lons Used	Weather Log At Time of Application(1)	R. bracteosum			R. lacustre		
							Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number	Live Stem Killed Per Cent	Bushes Killed Per Cent	Bushes Treated Number
	Still Creek					Fog in early a.m. Weather generally fair for remainder of day.						
7/25/28	I A (0-1)	A (2) + Calcium chloride	2.70	9.0	12.0	do	94	33	33	99	30	27
7/26/28	I A (1-2)	A + Sodium hydroxide	1.40	6.8	3.0	do	99	63	8	96	20	10
7/26/28	I A (2-3)	A + Calcium chloride	2.70			do	90	29	14	99	0	2
7/26/28	I B (0-1)	A + Sodium hydroxide	2.00	9.0	2.0	do	99	20	10			0
7/26/28	I B (1-2)	A + Sodium hydroxide	0.89			do			0	94	0	5
7/26/28	I B (2-3)	A + Sodium hydroxide	2.00	6.8	3.5	do	40	0	1	95	14	7
7/26/28	II A (0-1)	A + Calcium chloride	2.70	9.0	6.0	do	99	39	28	94	43	7
7/26/28	II A (1-2)	A + Calcium chloride	2.70	9.0	6.0	do			0	99	75	44
7/27/28	I A (0-1)	A + Sodium hydroxide	0.89			do	95	0	11	98	49	68
7/27/28	I A (1-2)	A + Sodium hydroxide	0.89			do			0	100	100	3
7/28/28	I B (0-1)	A + Sodium hydroxide	0.42			Fog in early a.m. Remainder of day clear and cool.	95	0	13	95	15	33
7/28/28	I B (1-2)	A + Sodium hydroxide	2.00	6.8	19.0	do	99	16	23	99	69	29
7/30/28	I B (3-4)	A + Sodium hydroxide	1.40			do	98	20	10	98	45	45
7/30/28	I A (2-3)	A + Sodium hydroxide	2.00			do	98	30	47	98	58	40
7/31/28	I A (3-4)	A + Sodium hydroxide	0.16			do	97	23	40	98	67	30

(1) Relative humidity and soil temperature not taken during 1928 Oregon spraying.

(2) Sodium chlorate.









W. 840-G. roezli in Plot I Area II, S.F. Stanislaus River, Calif. Completely killed. Sprayed July, 1928 with  $\text{NaClO}_3$  2.7 lbs. + ammonium chloride 1.6 lbs. per gal. water, pH 9. Picture taken July, 1928.



W. 843-G. roezli in Plot IX A (0-1) Leland Meadow, Calif. Resprouting from crown. Sprayed July 1928 with  $\text{NaClO}_3$  2.7 lbs. +  $\text{CaCl}_2$  3.0 lbs. per gal. water, pH 12. Picture taken July, 1929.









W. 539 n. nevadensis in Plot 1 Area 1, S. F. of Stanislaus River, Calif. Resprouting from crown. Sprayed June, 1928 with NaClO<sub>3</sub> 2.7 lbs. + CaCl<sub>2</sub> 2.4 lbs. per gal. of water, pH 9. Picture taken July, 1929.



W. 836 n. nevadensis in Plot 1 Area 1, S. F. of Stanislaus River. Completely killed. Sprayed June, 1928 with NaClO<sub>3</sub> 2.7 lbs. + CaCl<sub>2</sub> 2.4 lbs. per gal. water, pH 9. Picture taken July, 1929.







Discussion of Oregon Work. Chlorate sprays of concentration less than 1.4 per gallon (15%) were relatively ineffective on R. bracteosum. Chlorate sprays of higher concentration (2-2.7 lbs. per gal.) gave kills of 17 and 48%, respectively. The addition of alkali cut down the efficiency of the chlorate, viz.,

Spray.	Alone	with 2% NaOH
Sodium chlorate .89 lb.	0% kill	0% kill
" " 1.4 lb.	63% kill	30% kill
" " 2.0 lbs.	17% kill	23% kill
" " 2.7 lbs.	48% kill	20% kill

The results of spraying R. lacustre were rather encouraging in view of the large mats of extremely vigorous bushes. This type of growth is extremely difficult to eradicate by hand. The kill of live stem was complete in almost all cases and the effectiveness of eradication is much greater than the percentage kill of bushes would indicate. R. lacustre as it grows in Oregon seems to be more susceptible to the toxic action of sodium chlorate than the same species under Idaho conditions. It is interesting to note from Table 3 that alkali increased the effectiveness of dilute solutions of chlorate on R. lacustre under Oregon conditions as it did in Idaho.

For both R. lacustre and R. bracteosum the effectiveness of a mixture of sodium chlorate and calcium chloride was inversely proportional to the calcium chloride content. At variance with this observation was a 75% kill of bushes obtained at Veda Lake with an intermediate concentration of calcium chloride added to the regular strength sodium chlorate.

#### The Application of New Ribicides in Idaho, California and Oregon in 1929.

At Santa, Idaho, new Ribicides were tested by spray application to the sum forms of G. inermis and R. lacustre. These plots were of regulation size, 100x33 feet. Plots were also located in the stream type in order to test the sprays on shade types of G. inermis and R. lacustre. These plots were marked with stakes in the regular manner but were not of uniform size owing to the scattered distribution of Ribes. Stream type plots are indicated in Table 4 by Ex. followed by a number, and were located opposite permanent plots X and XI. A summary of the experiments performed is given in Table 4.



Discussion of Oregon River. The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1. The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1. The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1.

Year	Area	Area
1934	1.1	1.1
1935	1.1	1.1
1936	1.1	1.1
1937	1.1	1.1

The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1. The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1. The results of the investigation of the Oregon River, which was relatively extensive, are given in Table 1.

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TABLE NO. 4

SUMMARY OF EXPERIMENTAL SPRAYS APPLIED AT SANTA,  
IDAHO, DURING 1929 FIELD SEASON

Date of Application	Plot Number	Chemical Used	Concentration Lbs. Per Gal. H <sub>2</sub> O	pH of Spray	Gal- lons Used	At Time of Application		Weather Log
						Average Soil Temp. 7:30 a.m. to 5 p.m. Degrees F.	Average Relative Humidity 7:30 a.m. to 5 p.m.	
7/2/29	XI A (0-1)	A (1) + Magnesium chloride	2.70 1.50	6.5	2.0	55	37	Warm. Clear.
7/8/29	XI A (1-1.6)	A + Magnesium chloride	2.70 1.50	8.0	2.0	56	59	Warm. Clear.
7/8/29	XI A (1.6-2)	A + Magnesium chloride	2.70 1.50	4.0	2.0	56	59	Warm. Clear.
7/8/29	XI A (2-2.5)	A + Magnesium chloride	2.70 0.75	8.0	3.5	56	59	Warm. Clear.
7/9/29	XI B (1-2.2)	Y (2)	3.54	6.5	5.0	57	48	Warm. Clear.
7/9/29	XI B (2-2.3)	Y (3)	3.54	6.5	5.0	57	48	Warm. Clear.
7/10/29	XI A (2.5-3)	A + Magnesium chloride	2.70 0.75	4.0	6.0	50	44	Warm. Clear.
7/10/29	XI A (3-3.6)	A + Magnesium chloride	2.70 0.75	6.5	3.0	50	44	Warm. Clear.
7/11/29	XI A (3.6-4)	A + Magnesium chloride	2.70 0.38	8.0	3.0	57	48	Warm. Cloudy.
7/11/29	XI B (3-3.5)	A + Magnesium chloride	2.70 0.38	6.5	2.0	57	48	Warm. Cloudy.
7/11/29	XI B (3.5-4)	A + Magnesium chloride	2.70 0.38	4.0	4.0	57	48	Warm. Cloudy.
7/12/29	XI B (0-1)	A + Magnesium chloride	2.70 0.19	8.0	2.0	55	43	Warm. Cloudy.
7/12/29	XI A (4-4.5)	A + Magnesium chloride	2.70 0.19	4.0	3.0	55	43	Warm. Cloudy.
7/12/29	XI A (4.5-5)	A + Magnesium chloride	2.70 0.19	6.5	4.0	55	43	Warm. Cloudy.
7/13/29	XI A (5-5.5)	Y (2) + Magnesium chloride	2.88 3.54	6.5	5.0	59	38	Warm. Clear.
7/15/29	XI B (4-4.4)	Y (2)	3.54	6.5	5.0			
7/17/29	XI A (5.5-6)	+ Glue + Glycerine	1.40	6.5	5.0	66	30	Hot. Clear.
7/17/29	XI B (4-4.5)	X + Molasses	2.00	6.5	5.0	66	30	Hot. Clear.
7/17/29	XI B (5-6)	X + Molasses	2.00	6.5	5.0	66	30	Hot. Clear.
7/18/29	X B (0-4)	X + Molasses	2.70	6.5	5.0	65	39	Hot. Clear.
7/18/29	X B (.4-1)	X + Molasses	3.40	6.5	5.0	65	39	Hot. Clear.
7/22/29	X B (1-1.5)	X + Glue	2.70	6.5	5.0	59	34	Warm. Clear.
7/22/29	Ex. 1	X + Molasses	2.70	6.5	5.0	65	27	Warm. Clear.
7/23/29	Ex. 2	X + Glycerine	2.70	6.5	5.0	56	24	Warm. Clear.
7/23/29	XII A (0-.05)	X + Molasses	2.70	6.5	5.0	60	35	Warm. Clear.
7/25/29	XII A (.05-.1)	X + Molasses	2.70	6.5	5.0			Warm. Clear.
7/26/29	XII A (.1-.2)	X + Sodium thiosulphate	0.42 4.12		5.0			Warm. Clear.
7/26/29	XII A (.2-.3)	X + Sodium thiosulphate	0.89 4.12		5.0			Warm. Clear.
8/6/29	X B (1.5-2)	X + Sodium thiosulphate	2.00 2.05		5.0	59	56	Warm. Clear.
8/8/29	Ex. 3	Sodium thiosulphate	4.12		4.0	59	30	Warm. Clear.
8/9/29	Ex. 4	Sodium thiosulphate	3.09		5.0	58	26	Warm. Clear.
8/9/29	Ex. 5	Sodium thiosulphate	2.05		4.0	58	26	Warm. Clear.
8/24/29	Ex. 6	X + Glue (5) + Glycerine	0.89	8.0	6.0			
8/24/29	Ex. 7	X + Glue + Glycerine	1.40	8.0	5.0			
8/24/29	Ex. 8	X + Glue + Glycerine	2.00	8.0	5.0			
8/24/29	Ex. 9	X + Glue + Glycerine	2.70	8.0	5.0			
9/3/29	Ex. 10	Magnesium chloride	3.40		14.0			
9/3/29	Ex. 11	X + Ammonium chloride	1.40 0.50		5.0			
9/3/29	Ex. 12	X + Ammonium chloride	1.40 0.80		5.0			
9/3/29	Ex. 13	X + Magnesium chloride	2.70 0.27	10.0	5.0			
9/3/29	Ex. 14	X + Magnesium chloride	2.70 0.19	10.0	5.0			

(1) Sodium chlorate.

(2) New complex series made in field (Cu 1 :  $S_2O_3$  6 : CH 4).(3) New complex series made in field (Cu 1 :  $S_2O_3$  5 : CH 4).

(4) Standard complex furnished from quantity made in Spokane by H. R. Offord.

(5) Glue .02# per gallon water and glycerine .1 to .5# per gallon as sticker and binder.











about 1/2 mile west of the intersection of the  
 road and the river. The area is about 1/2 mile  
 long and 1/4 mile wide. It is a very fertile  
 area and is used for agriculture. The soil is  
 very rich and the water is very pure. The  
 area is very beautiful and is a very good  
 place to live. The area is very healthy and  
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TABLE NO. 5

SUMMARY OF EXPERIMENTAL SPRAYS APPLIED IN  
CALIFORNIA DURING 1923 FIELD SEASON

Date of Application	Plot Number	Chemical Used	Concentration Lbs. per Gal. H <sub>2</sub> O	pH of Spray	Spray Used	At Time of Application		
						Average Soil Temp. 7 a. m. to 5 p. m.	Average Relative Humidity	Weather Log
6/20/29	Gooseberry Camp S (3)	Y (1)	4.96	10.0	5	25	23	Warm. Clear.
6/22/29	I Aa Area I	Y (1)	3.54	6.5	5	56	21	Warm. Clear.
6/22/29	I Ab Area I	Y (1)	2.16	6.5	5	56	21	Warm. Clear.
6/22/29	I Ac Area I	Y (1)	1.41	6.5	5	56	21	Warm. Clear.
6/24/29	I Aa Area II	Y (2)	2.88	6.5	5	56	22	Warm. Clear.
6/24/29	I Ab Area II	Y (3)	3.54	6.5	5	56	22	Warm. Clear.
6/24/29	I Ac Area II	Y (3)	2.88	6.5	5	56	22	Warm. Clear.
6/24/29	I Ba Area II	Y (3)	2.88	6.5	5	56	22	Warm. Clear.
6/25/29	I Bb Area II	Y (2)	3.54	6.5	5	51	25	Warm. Clear.
		X (4)						
6/25/29	2a Area II	+ Molasses	2.40	6.5	5	51	25	Warm. Clear.
		X	2.70					
6/25/29	2b Area II	+ Glycerine (5)	0.04	6.5	5	51	25	Warm. Clear.
		X	2.70					
6/26/29	2c Area II	- Glycerine	0.24	6.5	5	56	33	Warm. Clear.
		X	2.70					
6/26/29	2d Area II	+ Molasses (6) + Magnesium chloride	0.38	6.5	5	56	33	Warm. Clear.
		X	2.70					
6/26/29	2e Area II	+ Glue (7)	2.70	6.5	5	56	33	Warm. Clear.
		X	2.40					
6/26/29	2f Area II	+ Molasses + Sodium thiosulphate	2.09	6.5	5	56	33	Warm. Clear.
		A (8)	2.70					
6/27/29	3a Area II	+ Magnesium chloride	2.60	6.5	5	57	34	Warm. Clear.
		A	2.70					
6/27/29	3b Area II	+ Magnesium chloride	2.60	12.0	5	57	34	Warm. Clear.
		X	3.57					
7/3/29	Leland Meadow V A (1-1a)	+ Glycerine	0.08	6.5	5		40	Clear. Warm.
		X	2.70					
7/3/29	V A (1a-1b)	+ Glycerine	0.24	6.5	5		40	Clear. Warm.
		X	2.40					
7/3/29	IV A (0-.7)	+ Glycerine	0.20	6.5	5		40	Clear. Warm.
		X	2.70					Clear and warm with cold morning and high humidity in early a.m.
7/10/29	Meadow Valley I	+ Molasses	0.96	6.5	30		47	
		X	2.70					Clear and warm with cold morning and high humidity in early a.m.
7/12/29	II (A) 0	+ Glue + Glycerine	0.16	6.5	10		40	
		X	2.70					Clear and warm with cold morning and high humidity in early a.m.
7/12/29	II (A) 1	+ Glue + Magnesium chloride	0.50	6.5	10		40	
		Y (3)	2.16					Clear and warm with cold morning and high humidity in early a.m.
7/15/29	III A (0-a)	+ Glycerine	0.20	6.5	10		46	
		Y (3)	2.88					Clear and warm with cold morning and high humidity in early a.m.
7/15/29	III B (0-a)	+ Glue + Glycerine	0.20	6.5	10		46	
		Y (3)	3.54					Clear and warm with cold morning and high humidity in early a.m.
7/15/29	IV A (0-a)	+ Glycerine	0.20	6.5	10		46	
		Y (3)	3.54					Clear and warm with cold morning and high humidity in early a.m.
7/15/29	IV A (a-b)	+ Glycerine	0.96	6.5	10		46	

- (1) Complex series made in field (Cu 1 : S<sub>2</sub>O<sub>3</sub> 8 : CN 2 ).  
 (2) Complex series made in field (Cu 1 : S<sub>2</sub>O<sub>3</sub> 7 : CN 3 ).  
 (3) Complex series made in field (Cu 1 : S<sub>2</sub>O<sub>3</sub> 7 : CN 4 ).  
 (4) Standard complex from lot made in Spokane by H. R. Offord.  
 (5) Glycerine added as binder 0.1# per gallon water.  
 (6) Molasses added as a binder 0.2# per gallon water.  
 (7) Glue added as a sticker 0.02# per gallon water.  
 (8) Symbol for sodium chlorate.









W.846-Showing the intimate association of G. inermis and willow, Meadow Valley Creek, Meadow Valley, Calif. Hand eradication of G. inermis under these conditions is very costly.



W.847-Showing typical growth of G. inermis in stream type, Meadow Valley Creek, Meadow Valley, Calif.











The 1933 surveying in Oregon started downstream of the mouth of the  
 E. Washington, N. San Gabriel and E. Little. The 1933 surveying  
 located one and a half miles down stream from the still present  
 the west bank of the stream. The 1933 surveying  
 in an area south of the Loop Highway about 3 miles east of the river  
 and a short distance east of the mouth of the river. The area  
 is an open southeast exposure covered with broken lava and sandstone  
 on three sides by Douglas fir. The bottom is in constant change  
 were drifting heavily at the time when the rocks were deposited.  
 The 1933 E. Washington plot was located at - cover, Oregon, five miles  
 up the San Juan river above Detroit in the eastern national forest.  
 About two miles above lower old Spanish looking east, the river is  
 marked by a sign on the right hand side of the road. The area is  
 moderately brushy and cut over, very wet and dry, and the hills medium  
 in size growing in scattered clumps. E. Little plots were established  
 on the west bank of the Creek one-fourth mile from the mouth of the river.  
 The steep talus slope adjacent to the stream enters in small rock outcrops  
 this small rock is the grade of the river, which is the only  
 few in great abundance. Little No. 3 was situated on the west bank of the  
 forest at Still Creek, Loop Highway, about a mile and a half  
 Table 2a summarizes the vegetation and altitude recorded in the  
 Lake and Still Creek areas over 1933 plots.



TABLE NO. 6

SUMMARY OF EXPERIMENTAL SPRAYS APPLIED IN OREGON  
DURING 1929 FIELD SEASON

Date of Appli- cation	Plot Number	Chemical Used	Concen- tration Lbs. per Gal. H <sub>2</sub> O	pH of Spray	Gal- lons Used	At Time of Application (1)		Weather Log(2)
						Average Relative Humidity 7 a.m. to 5 p.m.		
7/29/29	Still Creek I A (0-1)	X (3) + Glycerine	1.80	6.5	10	33		Clear. Warm.
7/30/29	I A (1-2)	X + Glycerine + Glue	2.40	6.5	10	45		Sultry. Cloudy.
7/30/29	I A (2-3)	X + Glycerine	2.70	6.5	10	45		
7/30/29	I A (3-4)	X + Magnesium chloride	2.70 0.75	6.5	10	45		
7/31/29	I B (2-3)	A (4) + Glue + Magnesium chloride	1.40 1.50	6.5	10	54		Sultry. Cloudy.
8/1/29	I B (3-4)	Y (5) + Glycerine + Glue	2.16	6.5	10	80		Foggy.
8/2/29	II A (0-1)	Y + Glycerine + Glue	2.88	6.5	10	75		Foggy in early a.m. Clear in p.m.
8/2/29	II A (1-2)	Y + Glycerine + Glue	3.54	6.5	10	75		
8/6/29	Loop Highway I A	X + Glycerine	2.40	6.5	5	42		Hot. Clear.
8/6/29	II	X + Glycerine	2.70	6.5	5	42		Hot. Clear.
8/7/29	I B	Y + Glycerine	2.88	6.5	5	47		Hot. Clear.
8/7/29	III	Y + Glycerine	3.54	6.5	5	47		Hot. Clear.
8/8/29	IV A	A	1.40	6.8	5	37		Hot. Clear.
8/8/29	IV B	A + Glycerine + Sodium hydroxide	1.40 0.08		5	37		Hot. Clear.
8/13/29	Santiam River I	Y + Glycerine	2.88	6.5	5	23		Hot. Clear.
8/13/29	II	Y + Glycerine	3.54	6.5	5	23		Hot. Clear.
8/13/29	V	X + Glycerine	2.40	6.5	5	23		Hot. Clear.
8/13/29	VI	Y + Glycerine	3.54		5	23		Hot. Clear.
8/13/29	III	A + Glycerine	1.40	6.5	5	23		Hot. Clear.
8/13/29	IV	A + Glycerine + Sodium hydroxide	1.40 0.08		5	23		Hot. Clear.
8/17/29	Mud Creek I	Y	2.88		5	34		Clear. Warm.
8/17/29	II	X	2.40	6.5	5	34		Clear. Warm.
8/17/29	III	Y + Glycerine + Glue	3.54	6.5	5	34		Clear. Warm.
8/17/29	IV	X + Glycerine + Glue	2.70	6.5	5	34		Clear. Warm.
8/17/29	V	A + Glycerine + Glue	1.40	6.5	5	34		Clear. Warm.
8/17/29	VI	A + Sodium hydroxide	1.40 0.08		5	34		Clear. Warm.

(1) Soil temperatures were not taken.

(2) Weather characterized by high early morning humidity throughout course of Oregon work.

(3) Standard complex furnished from quantity made at Spokane by H. R. Offord.

(4) Sodium chlorate.

(5) New complex series made in field (Cu 1 : S<sub>2</sub>O<sub>3</sub> 6 : CN 4).







TABLE NO. 6a

## RESPRAY WORK IN OREGON, 1929 (1)

Date	Location	Chemical	Concen- tration	pH	Gals.	Weather Log
7/31/29	Area II I A (0-2)	NaClO <sub>3</sub> +	1.4#		5	43% - 2 p.m. sultry
		NaOH	0.08#			65% - 6 p.m. overcast
7/31/29	Area II I A (2-3)	NaClO <sub>3</sub>	1.4#	6.8	4	Fog a.m.; clearing by noon.
7/31/29	Area I A (2-3)	NaClO <sub>3</sub>	1.4#	6.8	5 on 3 plots	do

(1) The alkaline sprays were applied on sections containing a large amount of *R. lacustre*. The neutral sprays were applied on sections which contained more *R. bracteosum*.



# TABLE 1

(1) ANALYSIS OF URIC ACID

Date	Location	Chemical Reaction	Amount	Notes
7/21/28	Area II	$\text{HClO}_4 +$	1.44	400 - 5 p.m. sitting
7/21/28	Area I (S-3)	$\text{HClO}_4$	0.084	400 - 5 p.m. sitting
7/21/28	Area II	$\text{HClO}_4$	1.44	400 - 5 p.m. sitting
7/21/28	Area I (S-3)	$\text{HClO}_4$	0.084	400 - 5 p.m. sitting
7/21/28	Area I	$\text{HClO}_4$	1.44	400 - 5 p.m. sitting
7/21/28	Area I (S-3)	$\text{HClO}_4$	0.084	400 - 5 p.m. sitting

(1) The alkaline reagents were applied on sections containing a large amount of H. fructosum. The neutral reagents were applied on sections which contained more H. fructosum.



#### Notes on Spraying as Performed Under Tables 4, 5 and 6.

Hopes for the mixture sodium chlorate and magnesium chloride as a possible Ribicide for G. inermis were rudely shattered when spontaneous fires in California and Idaho made further tests inadvisable. Although the mixture is more hygroscopic than the Atlacide mixture it seems to be much more readily decomposed in the presence of organic material.

Late season observations of the toxic action of X sprays suggested that the mixture is less toxic under field conditions than it was in the greenhouse. Some releasing was noted in the California, Oregon and Idaho areas, particularly in the shady locations. In general, direct exposure to the sunlight increased toxicity of the sprays. Glycerine proved to be the best binder and hygroscopic agent although the addition of the necessary 2 to 3% makes the price of the spray somewhat prohibitive. Moreover, it is possible that the addition of so much inert material materially reduces the toxic action of the complex.

Y sprays appeared to be generally less effective than the X complex in all three states where experiments were conducted. The high cyanide content, furthermore, makes these sprays very disagreeable to handle and may possibly rule them out on the basis of toxicity to livestock.

A number of experiments (not listed in the above tables) were carried out near Watsonville, California on Mr. Goodale's ranch. Complex X with molasses as a binder, and mixtures of sodium chlorate with magnesium chloride and Atlacide were tested by spray application to a planting of cultivated currants on April 17. The area was checked July 24, and the results photographically recorded by Mr. MacLeod. Complex X killed 50% live stem of R. aureum but the resprouts and remaining live stem appeared quite vigorous. It was more effective on the red currant, R. rubrum, but here again results were not encouraging. On black currants, R. nigrum, very little toxic action was apparent. Mixtures of magnesium or calcium chloride with sodium chlorate were equally effective, both sprays giving complete kills of R. nigrum. About 90% kill of R. rubrum bushes and 25% of R. aureum bushes were obtained with the chlorate mixtures. It is evident from these experiments that the susceptibility of cultivated black currants is about the same as R. petiolaris.

#### Spray Formulae Recommended for Idaho, California and Oregon Ribes.

The spray formulae recommended are given under two classifications. Series A contains chemical formulae that have given a sufficiently



seems to be much more readily accomplished in the presence of 50% alcohol. Although the mixture is more viscous than the alcohol solution, as a possible indication of the higher molecular weight of the polymer, the films in California and Ohio were readily prepared with good results. Hope for the mixture solution method was increasing as the

Late season observations of the toxic action of spray suggested that the mixture is less toxic under field conditions than it was in the greenhouse. Some relief was noted in the California, Oregon and Idaho areas, particularly in the early locations. In general, direct exposure to the sunlight increased the toxicity of the spray. Glutamine proved to be the best diluent and insecticide spray. Although the addition of the necessary 5 to 10 percent of the mixture was somewhat prohibitive, it is possible that the addition of 20 percent material will reduce the toxic effect of the mixture.

Y appears appeared to be actually less effective than the other two. A complex in all three states made examinations were conducted. The high chloride content, furthermore, makes that the value is high. able to handle and may possibly rule them out on the basis of toxicity.

A number of experiments (not listed in the above tables) were carried out near Batesville, California on Dr. Goodale's ranch. Complex K with mixtures of *E. rubrum*, and mixtures of several other species with *E. rubrum* and *E. nigra* were tested by giving baited traps to a quantity of unfixed corvids on April 17. The area was checked July 24, and the results photomicrographically recorded by Mr. Woodcock. Complex K killed 80% live stem of *E. rubrum* but the response and remaining live stem appeared quite vigorous. It was more effective on the red current, *R. rubra*, but here again results were not encouraging. On black currants, *R. nigrum*, very little reaction was apparent. Mixtures of combinations of certain colonies with similar effect were equally effective, both on a living colony illia of *E. rubrum*. About 90% kill of *E. rubrum* bushes and 80% of *E. rubrum* bushes were obtained with the various mixtures. It is evident that these experiments that the susceptibility of coltiv to black currents is greater than as *E. perfoliata*.



high percentage of kill and are economically practical for use in control work. Series B suggests the most toxic chemical for each of the Ribes tested though not recommended for large scale field use as yet owing to high cost, toxicity to operator, or extreme fire hazard. The chemicals given in Series B have not been tested conclusively on a large scale.

#### Series A

<u>Chemical</u>	<u>Concentration</u>	<u>pH</u>	<u>For Eradication of</u>
Sodium chlorate or Atlacide	0.89# per gal. water 1.4# " " "	6.1-6.8 "	<u>R. petiolare</u> "
Sodium chlorate or (1) Atlacide	1.4# " " " 2.2# " " "	5.6-6 "	<u>R. viscosissimum</u> "

#### Series B

Sodium chlorate plus Manganese chloride	3.4# per gal. water 0.008# " " "	6.4-6.8	<u>R. lacustre</u> (Idaho) <u>G. inermis</u>
Sodium chlorate plus Calcium chloride	2.7# " " " 2.4# " " "	9	<u>G. roezli</u>
Sodium chlorate plus Ammonium chloride plus Furfural	1.0# " " " 1.2# " " " 0.04# " " "	Slightly Acid	<u>R. nevadense</u>
Sodium chlorate	1.4# " " "	6.8	<u>R. bracteosum</u>
Sodium chlorate plus Calcium chloride	2.7# " " " 2.8# " " "	9	<u>R. lacustre</u> (Oregon)

Notes: (1) Recommendation for the chemical is made with a reservation concerning fire risk. Area should be watched during hot bright weather.  
Glue .01% of the dry weight of chemical used is added as a sticker and a spreader of all above sprays.

#### TENTATIVE OUTLINE OF RESEARCH WORK TO BE UNDERTAKEN AT BERKELEY - 1929-1930

##### Preparatory Field Work.

A study of the total starch reserves and of the depletion of those starch reserves following application of a chlorate spray showed



high percentage of mill and are economically produced for use in cement work. Series 5 suggests the most toxic condition for use of the kibes tested though not recommended for large scale use as yet owing to high cost, toxicity to operators, or excessive fire hazard. The chemicals given in Series 5 have not been tested conclusively on a large scale.

#### Series 4

Chemical	Concentration	Exposure	For the duration of
Sodium chlorate or	0.88 per gal. water	2-3-5	2-3-5
Attaclite	1.44 " " "	" " "	" " "
Sodium chlorate or (I)	1.44 " " "	2-3-5	2-3-5
Attaclite	1.44 " " "	" " "	" " "

#### Series 5

Sodium chlorate plus	0.44 per gal. water	2-3-5	2-3-5
Manganese chloride	0.008 " " "	" " "	" " "
Sodium chlorate plus	0.44 " " "	" " "	" " "
Calcium chloride	0.44 " " "	" " "	" " "
Sodium chlorate plus	1.44 " " "	" " "	" " "
Ammonium chloride plus	1.44 " " "	" " "	" " "
Ammonium chloride plus	1.44 " " "	" " "	" " "
Ammonium chloride plus	1.44 " " "	" " "	" " "
Sodium chlorate	1.44 " " "	" " "	" " "
Sodium chlorate plus	0.44 " " "	" " "	" " "
Calcium chloride	0.44 " " "	" " "	" " "

Notes: (1) Recommendation for the chemical is made with a reservation concerning fire hazard. Items should be tested during hot and dry weather.  
 (2) If the dry weight of chemical used is noted as a factor and a spreader of all sorts used.

RELATIVE TOXICITY OF CHEMICALS USED IN THE TESTS  
 1931-1932

Preparatory field work

A study of the local station reserves and of the decision of those station reserves following application of a chemical spray showed



that the four *Ribes* species (Idaho) stand in the following order - *R. petiolare*, *R. viscosissimum*, *R. lacustre* and *G. inermis* in decreasing order of starch depletion following application of sodium chlorate and corresponding increasing of starch level maintained in the normal plant. In order to establish this fact on a quantitative basis, samples of the leaves, current stem, 1-year stem, old stem, layering stems, large roots and small roots of the four above-named *Ribes* were collected at 14-day intervals from June 1 to September 1. The total starch content will be determined quantitatively this winter at the University of Idaho.

Leaves of the same species were gathered at the same time for tannin determinations.

Material for morphological work to be undertaken by Mrs. Irma E. Webber at the University of California was carefully collected and included *R. petiolare*, *G. inermis*, *R. lacustre* and *R. viscosissimum* from Idaho; *R. bracteosum*, *R. lacustre*, *G. watsoniana* and *R. triste* from Oregon and *R. nevadense*, *G. roezli* and *R. cereum* from California.

#### Laboratory Experiments.

- (1) Analysis of *Ribes* samples collected as previously stated.

Purpose. To establish quantitatively the relationship existing between the total starch reserve and susceptibility to chlorates and to correlate those results with the large scale seasonal tests of chlorate applied at Clarkia, Idaho. Ditto for tannins.

- (2) Study of the chemistry of complex compounds, organic and inorganic.

Purpose. To devise new Ribicides for the destruction of *Ribes* heretofore resistant.

- (3) Application of compounds devised under (2) to greenhouse *Ribes*.

Purpose. To obtain preliminary data on the toxicity of those compounds to several *Ribes* species.

- (4) Study of the action of dilute chlorate solutions on *Nitella* in pH medium of 5.67 and 6.1 and 5.2.

Purpose. To obtain information concerning the toxic action of chlorates in pH medium exactly equivalent to the cell sap as further confirmation of the theory that maximum toxicity is secured where penetrating chemical corresponds most closely to the plant constituents and involves a minimum of initial reactions.

- (5) Study of the reaction of starch-chlorate under various conditions under the influence of ultra-violet light. In the event of decomposition taking place a study of the decomposition products of that reaction.



that the four ribes species (Idaho) found in the following order - *R. viscosissimum*, *R. viscosum*, *R. petiolare*, *R. cereum*. The order of starch digestion following application of iodine solution corresponding increasing starch level indicated in the normal of leaves. In order to establish this fact on a quantitative basis, analysis of the leaves, current stem, 1-year stem, old stem, 1-year stem, large roots and small roots of the four above-mentioned species collected at 14-day intervals from June 1 to September 1. The starch content will be determined quantitatively thus later at the University of Idaho.

Leaves of the same species were gathered at the same time for starch determinations.

Material for morphological work to be undertaken at the University of California was carefully collected and included *R. petiolare*, *R. viscosum*, *R. viscosissimum*, *R. cereum*, *R. macrocarpum*, *R. lasiocarpum* and *R. fruticosum* from Idaho; *R. macrocarpum*, *R. lasiocarpum* and *R. fruticosum* from Oregon; and *R. nevadense*, *R. prostratum* and *R. cereum* from California.

#### Laboratory Experiments

(1) Analysis of ribes samples collected as previously stated. Purpose: To establish quantitatively the relationship existing between the total starch reserve and susceptibility to chlorosis and to correlate those results with the large scale seasonal tests of chlorosis applied at Clarkia, Idaho, with for fumigation.

(2) Study of the chemistry of complex compounds, organic and inorganic. Purpose: To devise new niches for the detection of ribes reserve to be resistant.

(3) Application of compounds tested under (2) to greenhous ribes. Purpose: To obtain preliminary data on the toxicity of these compounds to several ribes species.

(4) Study of the action of direct infrared radiation on ribes in the medium of 0.5% and 0.1% H<sub>2</sub>O. Purpose: To obtain information concerning the toxic action of ultraviolet in ribes and its equivalent to the cell wall as far as over-irradiation of the theory that ultraviolet is absorbed with a penetrating chemical compounds most closely to the plant constituents and involves a minimum of initial reactions.

(5) Study of the reaction of starch-chlorate under various conditions under the influence of ultra-violet light. In the event of successful taking place a study of the decomposition products of starch chlorate.



Purpose. To furnish data on the mechanism of toxic action of chlorates and to determine, if possible, the toxic action of decomposition products.

(6) Study of the effect of chlorate on the respiration of Ribes.

Purpose. To obtain confirmation of the physiological nature of the stimulus provided by the chlorate and correlation, if possible, with seasonal habits of Ribes.

(7) Study of the spontaneous combustion of mixtures of organic materials with sodium chlorate under different light intensities, and the effect of negative catalyzers of that reaction.

Purpose. To reduce the fire hazard in connection with the use of chlorates by the addition of some inert material which affects accumulation of light intensity.

(8) Continuation of morphological work as outlined in 1928 annual report with the ecological forms of Ribes collected August of 1929 in Idaho, Oregon and California.

Purpose. To arrive at an understanding of structural differences which may account for differences previously observed in susceptibility to toxic chemicals. Formation of starch and tannins to be kept in mind in the course of work.



proposed. To furnish data on the mechanism of light action on chlorate and to determine, if possible, the basic nature of the reaction products.

(3) Study of the effect of chloride on the reaction of chlorate. To obtain confirmation of the experimental nature of the reaction provided by the chlorate and chloride, if possible, within reasonable limits of chloride.

(4) Study of the spontaneous conversion of mixtures of organic materials with sodium chlorate under different light intensities, and the effect of negative catalysts on that reaction. To relate the rate of conversion in connection with the rate of conversion by the addition of some inert material which affects the rate of light intensity.

(5) Confirmation of morphological work as outlined in 1925 and 1926 with the ecological forms of chlorate collected from the same Oregon and California. To arrive at an understanding of the mechanism which may account for differences previously observed in chlorination to toxic chemicals. Formation of atoms and radicals to be used in the course of work.



## EXPERIMENTS WITH SPRAYING METHODS AND EQUIPMENT

MORRO CREEK, CALIFORNIA - 1929

By

H. E. Swanson,

Agent

### INTRODUCTION

At the close of the 1928 field season, practical methods of operation for chemical eradication had been developed with both knapsack and power equipment. For a final determination of the relative costs of eradication between knapsack and power work, it was necessary to conduct a further experiment on an extensive scale. During the months following the close of the 1928 field season, a careful search was made for equipment which would be better suited for the work. Also some special attachments and equipment were designed and made up by members of the office personnel. Before making final recommendations for the 1929 field work, it was necessary to give this equipment a thorough trial. There was also a lack of a sufficient number of qualified supervisors with experience in chemical eradication, to conduct the work during the coming season. Consequently, there was a three-fold need of a large experimental project in chemical eradication to be conducted during January and February in order to give sufficient time for the purchase of equipment and the construction of any special equipment before starting work in Idaho in the following June.

### PURPOSE

The purpose of the experimental project conducted in California is defined by the needs which it was to meet,

1. To determine the final relative costs of chemical eradication by the knapsack and power units.
2. To give the new types of equipment a complete and thorough trial.
3. To provide a training in chemical eradication for future field supervisors in the work.

### LOCATION AND TIME OF WORK

California offered the only possibility of a representative area for this experimental work during the winter months. Considerable scouting was done between Berkeley and Los Angeles to find the most suitable location. Some difficulty was encountered in finding an area on which the conditions were comparable to those in Idaho. One on Morro



EXPERIMENTAL WORK WITH CHEMICAL WEAPONS  
1938-1939

BY  
J. A. SWANSON  
Lieutenant

INTRODUCTION

At the close of the 1938 field season, previous results of operation for chemical eradication had been developed with both methods and power equipment. For a final determination of the relative costs of eradication between handpack and power work, it was necessary to conduct a further experiment on an intensive scale. During the months following the close of the 1938 field season, a careful search was made for equipment which would be better suited for the work. Also some special attachments and equipment were designed and made up by members of the office personnel. Before making final recommendations for the 1939 field work, it was necessary to give this equipment a thorough trial. There was also a lack of sufficient number of unqualified supervisory staff with experience in chemical eradication, so that the work during the coming season. Consequently, there was a great need of a large experimental project in chemical eradication to be conducted during January and February in order to give sufficient time for the purchase of equipment and the completion of the work. Equipment details starting on January 1 in the following items:

OBJECTS

- The purpose of the experimental project conducted in California is defined by the needs which it was to meet.
1. To determine the final relative costs of chemical eradication of the knapsack and power units.
  2. To give the new types of equipment a complete and thorough trial.
  3. To provide a training in chemical eradication for future field supervisors in the work.

LOCATION AND TIME OF WORK

California offered the only possibility of a representative area for this experimental work within the winter months. Consequently, a search was made between Berkeley and Los Angeles to find the most suitable location. Some difficulty was encountered in finding an area in which the conditions were comparable to those in Idaho. One on the



Creek, in the northern end of the Santa Barbara National Forest was finally selected. Although not entirely satisfactory, this area approximated northern conditions and was adequate for the purposes of the project.

Actual experimental work was begun on Morro Creek on January 11, 1929 and completed on February 15, 1929.

#### PERSONNEL

Thirteen men from the Spokane Office carried on all the work. These men were from the eradication and reconnaissance projects and were men who will probably, in coming seasons, supervise chemical eradication units.

#### METHODS EMPLOYED

Distinct from the methods of eradication were the methods employed to secure the data necessary. For the comparison of costs between knapsack and power spraying, approximately one mile of stream type consisting of thirty acres was selected. This was first sprayed with knapsack equipment and then sprayed with power equipment. To secure the costs in heavy and medium concentrations, different kinds of brush were designated to be sprayed.

All the men used the various types of equipment to be tried out. Their reaction to its use gave a sound judgment as to the human factor involved in the ease of handling and carrying. The new equipment was used throughout to test its durability and a record kept as to any defects.

As a training project, each man performed the work as sprayer and performed all the other duties involved in both knapsack and power work. They assembled their own equipment at the beginning of the work and made any repairs or adjustments which were necessary after the equipment was put in use.







## RESULTS

### A. Determination of the relative costs of eradication by power and knapsack spraying.

#### 1. Results in heavy concentration 30% - 40%.

Method of Work	No. of Acres	Man Hours Spraying	Man Hours Assisting	Total Man Hours	Gals. of Chem.	Per Acre			
						Man Hours Spraying	Man Hours Assisting	Total Man Hours	Gals. Chem.
Power	30	252	75	327	2,600	8.4	2.5	10.9	87
Knapsack	30	299	64	363	2,339	10.0	2.1	12.1	78

Cost per acre: power - \$23.19      Knapsack - \$18.34

\*Basis of costs: \$1.40 per man hour - power  
                       \$1.00 per man hour - knapsack  
                       \$.08 per gallon chemical

#### 2. Results in medium concentration 10% - 13%.

Method of Work	No. of Acres	Man Hours Spraying	Man Hours Assisting	Total Man Hours	Gals. of Chem.	Per Acre			
						Man Hours Spraying	Man Hours Assisting	Total Man Hours	Gals. Chem.
Power	23	113.0	34.0	147	939	5.0	1.4	6.4	41
Knapsack	23	79.7	13.3	93	692	3.4	0.6	4.0	30

Cost per acre: power - \$12.21

Knapsack \$6.45

#### 3. Conclusions.

a. In heavy concentrations, the cost of power work proved to be 21% greater than knapsack.

b. In medium concentrations, the cost of power work proved to be 89% greater than knapsack.

\*Based on costs resulting from power spraying at Musselshell Creek and knapsack spraying work on Clearwater and Potlatch Timber Protective Associations in 1929.



# RESULTS

a. Determination of the relative costs of application of power and Knapsack spraying.

1. Results in heavy concentration 10% - 100.

	Method of Work	No. of Acres	Man Hours	Man Hours	Total Cost	Man Hours	Man Hours	Total Cost
			Assist- ing	Assist- ing	Man of Spray- ing	Man of Spray- ing	Man of Spray- ing	Man of Spray- ing
Power	30	252	75	327	2,800	8.4	2.3	10.0
Knapsack	30	252	64	266	2,348	1.0	2.1	12.1

Cost per acre: power - \$23.12 Knapsack - \$18.24  
 Basis of costs: \$1.40 per man hour - power  
 \$1.00 per man hour - Knapsack  
 2.08 per gallon clean oil

2. Results in medium concentration 10% - 15.

	Method of Work	No. of Acres	Man Hours	Man Hours	Total Cost	Man Hours	Man Hours	Total Cost
			Assist- ing	Assist- ing	Man of Spray- ing	Man of Spray- ing	Man of Spray- ing	Man of Spray- ing
Power	32	112.0	34.0	147	932	5.0	1.4	6.4
Knapsack	32	112.7	18.8	82	632	3.4	0.8	4.0

Cost per acre: power - \$11.21 Knapsack \$5.42

## 3. Conclusions.

- In heavy concentration, the cost of power was found to be greater than Knapsack.
- In medium concentration, the cost of power was found to be greater than Knapsack.

\*Based on costs resulting from power spraying at Massachusetts State and Knapsack spraying with an Oleaster and Pelican Throat Protective Association in 1927.



## B. Description of Methods Employed.

### 1. Power method.

#### a. Organization.

One foreman  
One main-line hoseman  
One mechanic  
Ten sprayers

#### b. Equipment.

Two motors (Ross pumper and Pacific Marine)  
2,200 feet  $\frac{1}{2}$ " main-line hose in 100-ft. sections  
3,000 feet  $\frac{3}{4}$ " lateral hose line in 300-ft. sections  
400 feet  $\frac{1}{4}$ " hose in 200-ft. sections  
10 utility trigger nozzles with 4-ft. extensions and ball checks

#### c. Method of working.

The main-line hose, which is connected with the motor, is laid down the valley or canyon. Where a road or trail is present, it is well to use it for the laying of the main line. The width of the stream type determines the position of the main line. Where the width is 3 chains or under, the main line is laid in the open along the outer edge of the stream type. In case of wider stream type, the main line is laid within the stream type itself and approximately 3 chains from one of the side boundaries of the stream type. Three chains represents the distance which can be worked each way from the main line and for the best performance of the work, the main line is laid so as to have the 3-chain width on one side at least. The entire 2,200 feet of main line hose is laid out with Y couplings equipped with shut-offs at every 100 ft. section. As the power unit proceeds down the stream, it is the duty of the hose man to move the main-line hose from the upper end, when it becomes free, and couple it in and lay it out on the lower end. This provides a continuous line of  $\frac{1}{2}$ " hose down the valley. A motor is inserted in this main line hose every 1,800 or 2,000 feet. A mechanic is in charge at the motor and he also mixes the chemical solution. At 125# average pressure, the pumper is capable of providing the main-line hose with solution at sufficient pressure for a distance of 1,500 feet. The ten sprayers or nozzle-men are provided with a 300-ft. section of  $\frac{1}{4}$ " lateral with utility trigger nozzle and ball check, and 4-ft. extension. Each nozzle-man is assigned to a 100-ft. section of the stream type along the main line. In case of narrow stream type, he is given a 200-ft. section. He couples his lateral to the main line. The usual method of work is for him to spray his first strip across the stream type, at the end of which he detaches his nozzle, the ball check preventing the flow of spray, and proceeds to lay the string line for his next strip. When this string line is laid, the nozzle-man is back again



B. Description of methods employed.

1. Power method.

a. Organization.

- One foreman
- One air-line person
- One mechanic
- Ten sprayers

b. Equipment.

- Two motors (Horse power and electric driven)
- 2,500 feet  $\frac{1}{2}$ " main line hose in 100-ft. sections
- 3,000 feet  $\frac{1}{2}$ " lateral hose line in 100-ft. sections
- 400 feet  $\frac{1}{2}$ " hose in 100-ft. sections
- 10 utility trigger nozzles with 4-ft. extensions and ball couplings

c. Method of working.

The main-line hose, which is connected with one motor, is laid down the valley or canyon. Where a road or trail is present, it is well to use it for the laying of the main line. The width of the stream is determined the position of the main line. Where the width is changing or wider, the main line is laid in the open along the outer edge of the stream type. In case of wider stream type, the main line is laid within the stream type itself and approximately 4 chains from one of the side boundaries of the stream type. Three chains represents the distance which can be worked each way from the main line and for the best performance of the work, the main line is laid so as to have the 2-chain width on one side at least. The entire 2,500 feet of main line hose is laid out with Y couplings equipped with snap-rings at every 100 ft. section. As the power unit proceeds down the stream, it is the duty of one hose man to move the main-line hose from the upper end, when it becomes free, and couple it in and lay it out on the lower end. This provides a continuous line of  $\frac{1}{2}$ " hose down the valley. A second is inserted in the main line hose every 1,000 or 2,000 feet. A mechanic is in charge at the motor end and also in charge of the 1,500 foot pressure, the number of couplings of chemical solution. At 1,500 foot solution at sufficient pressure for providing the main-line hose with solution at sufficient pressure for a distance of 1,000 feet. The ten sprayers or nozzlemen are provided with a 300-ft. section of  $\frac{1}{2}$ " lateral with utility trigger nozzle and ball coupling and 4-ft. extension. Each nozzlemen is assigned to a 100-ft. section of the stream type along the main line. In case of narrow stream type, he is given a 200-ft. section. He couples his lateral to the main line. The usual method of work is for him to spray his first entire across the stream type, at the end of which he detaches his nozzle, the ball check preventing the flow of spray, and proceeds to lay the string line for his next strip. When this string line is laid, the nozzlemen is back again



on the main line hose at the intake end of his lateral. He now pulls in his lateral, attaches his nozzle and proceeds to spray the next strip. In this manner, each nozzleman works out his section, both spraying his strips and laying them out with string line. As each man finishes a block or section he uncouples his lateral and carries it down to the lower end of the main line where the hose man assigns him to a new section or block. Thus there is no move of the entire unit at one time, but it is simply a method having a main-line hose down the valley to which the men couple their laterals and work out a block of stream type, then move down to another section. Irregularities in the stream type often cause a deviation from the usual method of handling the lateral hose in working out a block. In most cases these irregularities constitute an advantage in the saving of time. Experienced nozzle-men can often save time by making use of these irregularities. In the case of tributary streams, these can be worked by laying out extra lengths of hose from 200 feet to 600 feet or as far up the draws as is necessary. The size of the stream would determine the number of men to be assigned to blocks, in order not to hold up the operations on the main drainage. It is necessary for the foreman of the unit to assist both the hose man and the mechanic. It is his duty to have the motor which is not in operation set up and ready to be connected with the main line.

## 2. Knapsack method.

### a. Organization.

One foreman  
Six sprayers

### b. Equipment.

Six knapsacks and pack boards  
Six Brown double-action pumps  
Six No. 111 Fine nozzles with 2-ft. extensions  
Five mixing boilers, five 1-gal. measures, five 3-gal. buckets

c. Method of working. The foreman lays out blocks for the sprayers. Each block consists of about a chain section of the stream type and is divided by string lines into  $\frac{1}{4}$ -chain strips. The size of the stream and brush conditions will determine whether such strips are to be run parallel with or crosswise of the stream. Each man is assigned to a block. Filling stations, with a boiler at each, are established at convenient places, preferably between every two blocks or on the average of about every two or three chains along the stream. The foreman moves the boilers, establishes the filling stations and mixes chemical for the men when the time permits. However, the men mix most of the chemical which they use.

There is some question as to the practicability of spending the added time in laying string line for individual strips in place of eliminating half of this time by widening the strips for a two-man crew.



on the main line hose at the intake end of the lateral. He may drill in his lateral, attached his nozzle and proceed to spray the next strip. In this manner, each nozzle man works out his section, both spraying his strips and laying them out with string line. As each man finishes a block or section he uncouples his lateral and carries it down to the lower end of the main line where the hose man assigns him to a new section or block. Thus there is no move of the entire unit one time, but it is simply a method of having a main-line hose down the valley to which the men couple their laterals and work out a block of stream type, then move down to another section. Irregularities in the stream type often cause a deviation from the normal method of handling the lateral hose in working out a block. In most cases these irregularities constitute an advantage in the saving of time. In the case can often save time by making use of these irregularities. In the case tributary streams, these can be worked by laying out extra lengths of hose from 200 feet to 500 feet or as far up the draws as is necessary. The size of the stream would determine the number of men to be assigned to blocks, in order not to hold up the operations on the main drainage. It is necessary for the foreman of the unit to assist both the hose man and the mechanic. It is his duty to have the motor which is not in operation set up and ready to be connected with the main line.

### 2. Knapsack method.

#### a. Organization.

One foreman  
Six sprayers

#### b. Equipment.

Six knapsacks and back boards  
Six Brown double-action pumps  
Six No. III line nozzles with 3-ft. extensions  
Five mixing boilers, five gal. measures, five 1-gal. buckets

c. Method of working. The foreman lays out blocks for the sprayers. Each block consists of about a chain section of the stream type and is divided by string lines into 2-chain units. The size of the stream and brush conditions will determine whether each strip is to be run parallel with or crosswise of the stream. Each man is assigned a block. Filling stations, with a boiler at each, are established at convenient places, preferably between every two blocks or on the reverse of about every two or three chains along the stream. The foreman moves the boilers, establishes the filling stations and mixes chemicals for the men when the time permits. However, the men mix most of the chemicals when they use.

There is some question as to the practicability of spending the added time in laying string line for individual strips in place of eliminating half of this time by widening the strips for a two-man crew.



Experience has demonstrated the following facts conclusively in regard to two-man (or more) crews equipped with knapsacks. A two-man crew presents two alternatives.

(1) Each man must wait until his partner empties his spray tank. Two men cannot, with satisfactory consistency, empty their tanks at the same time. The facts against this method are that the slowest man will be setting the speed; in addition to the time lost in waiting while spraying, will be the time lost in waiting for each other to fill their tanks; the rate of travel will be governed by the heaviest brush on the strip in place of a counter-balance between the light and heavy.

(2) Each man must return to the filling station and refill his tank without waiting for his partner. This practice results in a situation whereby one man a good part of his time is covering a two-man strip, which is impractical from the standpoint of speed and efficiency. This situation will continue over a large portion of the day, unless one man waits for the other. Confusion results when a man returns with a full tank without knowing where his partner left off spraying.

Both of these alternatives have the disadvantage of the loss in output of work resulting from men working together. They often spray each other or are in each other's way. Overspraying also occurs, since a "sprayed bush" does not appear as a "pulled bush". A man's attention cannot be directed entirely to his own work. On the other hand, individual responsibility and incentive to a greater output of work result from the individual block system. All duplication and lost motion are eliminated. By working along a man's output is increased by 14%. This was the situation with permanent personnel. With temporary men the difference would undoubtedly be greater. Under average conditions a man can lay string line for six men. With the increase in output accomplished by the individual strip system, time will be saved if conditions are such that the foreman can lay string for only three men along with his duties of establishing filling stations. In so far as possible, knapsack sprayers should work independently of each other.

In regard to laying string line, one man should always work along. Where two men are laying string line on the same strip, they are guiding each other and when one has difficulty in getting through the brush, the other one is held up regardless of how easy his own path may be.

### C. Test on New Equipment.

#### 1. Power.

a. Solution-cooled motors. Previous experience indicated that air-cooled motors were unsatisfactory for this work. The solution-cooled motors proved very satisfactory and no trouble was caused by overheating.



Experience has demonstrated the following facts conclusively in regard to two-man (or more) crews equipped with tanks. A two-man crew has two alternatives.

(1) Each man must wait until his partner empties his tank. Two men cannot, with satisfactory consistency, empty their tanks at the same time. The facts against this method are that it wastes time by setting the speed; in addition to the time lost in waiting while spraying, will be the time lost in waiting for each other to fill tanks; the rate of travel will be governed by the slowest tank on the strip in place of a constant distance between the tanks and hence.

(2) Each man must return to the filling station and wait in his tank without waiting for his partner. This method results in a situation whereby one man is good part of the time in covering a strip, which is impractical from the standpoint of speed and efficiency. This situation will continue over a large portion of the day, when one man waits for the other. Conclusion results when a man returns with a full tank without knowing where his partner left off spraying.

Both of these alternatives have the disadvantage of the loss in output of work resulting from men working together. They often result in each other or are in each other's way. Overlapping also occurs, since a "sprayed dump" does not appear as a "filled dump". A man's attention cannot be directed entirely to his own work. On the other hand, individual responsibility and incentive to a greater output of work result from the individual block system. All duplication and loss of time are eliminated. By working along a man's output is increased in this way. This was the situation with permanent personnel, with temporary men the difference would undoubtedly be greater. After average conditions are laid string line for six men. With the increase in output from three by the individual strip system, time will be saved in conditions are such that the foreman can lay string for only three men along with the double established filling stations. In so far as possible, images of spraying should work independently of each other.

In regard to laying string line, one man should always work alone. Where two men are laying string line on the same strip, they are likely to get confused in getting through the brush, the other one is held up regardless of how easy his own work is.

C. Test on new equipment.

I. Power.

a. Combination-cooled motors. Previous experience indicated that cooled motors were unsatisfactory for this work. The solution-cooled motors proved very satisfactory and no trouble was caused by overheating.



b. Ball checks. The arrangement of a ball check on the nozzle end of the  $\frac{1}{4}$ " lateral hoses proved entirely satisfactory and made possible the working out of the individual block system in power work.

c. Four-foot-1/8" iron extensions. These extensions, being much lighter than the former heavy  $\frac{1}{4}$ " iron, were very easily handled and were sufficiently strong. The added length, although causing some difficulty in dense brush, offered a distinct advantage by giving the nozzle-man a longer reach.

d.  $\frac{1}{4}$ " hose for main line. This hose proved to be too small to handle a large unit. It could only supply 5 nozzles with sufficient spray. Consequently it cannot be used for anything but laterals. There is a possibility of  $3/8$ " hose being satisfactory for main line.

## 2. Knapsack.

a. Double-action pumps. The double-action pump proved a great advancement over the single-action pump which had been used. The ease with which 50# pressure and more was obtained made it possible to use the No. 111 Fine nozzle, which makes a 20% saving on spray over the standard golden spray nozzle formerly used on the single-action pumps.

Two makes of double-action pumps were given a trial, the Brown pump and the Hudson pump. There are some differences in construction. Both of the Hudson pumps which were used proved to be of too delicate construction for use in this work. During the first week of work, both of these pumps had been broken beyond repair. On the other hand, the Brown pump, although being very light in construction, which is a distinct advantage when carrying it through the brush, remained intact through some of the most severe tests. All the Brown pumps, six in number, used throughout the knapsack work, were all in good working order at the close of the project. As the Brown pump is now sold on the market, there is one minor change which must be made, and that is the braising or welding on, in place of soldering, of a small piece on the end of the pump.

b. 2-ft.-1/8" iron extensions. These extensions with  $\frac{1}{4}$ " bushing and  $\frac{1}{4}$ " reducer on either end make a very satisfactory extension for the hand pump. They are considerably lighter in weight than the  $\frac{1}{4}$ " pipe and balance very well with the light Brown pump. They are sufficiently strong for the work.

c. Pack boards. There were four types of pack boards which were given a trial by each man.

1. Trapper Nelson - wire mesh and canvas covering.
2. Channel iron frame - wire mesh and canvas covering.
3. Clack pack frame.
4. Fibre board.



b. Ball checks. The arrangement of a ball check on the nozzle end of the 1" lateral hose proved entirely satisfactory and made possible the working out of the individual block system in power work.

c. Four-foot-1 1/2" iron extensions. These extensions, being much lighter than the former heavy 1 1/2" iron, were very easily handled and were sufficiently strong. The added length, although causing some difficulty in dense brush, offered a distinct advantage by giving the nozzle man a longer reach.

d. 1/2" hose for main line. This hose proved to be too small to handle a large unit. It could only supply 3 nozzles with sufficient spray. Consequently it cannot be used for anything but lateral. There is a possibility of 3/4" hose being satisfactory for main line.

### 2. Knapsack.

a. Double-action pump. The double-action pump proved a great advancement over the single-action pump which had been used. The ease with which 30% pressure had more was obtained made it possible to use the No. 11 fine nozzle, which makes a 30% saving in spray over the standard Golden spray nozzle formerly used on the single-action pump.

Two makes of double-action pumps were given a trial, the Brown pump and the Hudson pump. There are some differences in construction. Both of the Brown pumps which were used proved to be of too delicate construction for use in this work. During the first week of work, one of these pumps had been broken beyond repair. On the other hand, the Brown pump, although being very light in construction, which is a distinct advantage when carrying it through the brush, remained intact through some of the most severe tests. All the Brown pumps, six in number, used throughout the knapsack work, were all in good working order at the close of the project. As the Brown pump is now sold on the market there is one minor change which must be made, and that is the replacing or welding on, in place of soldering, of a small piece on the end of the pump.

b. 2-ft.-1 1/2" iron extensions. These extensions with 1/2" bushings and 1/2" reducer on either end make a very satisfactory extension for the hand pump. They are considerably lighter in weight than the 1 1/2" pipe and balance very well with the light Brown pump. They are sufficiently strong for the work.

c. Back boards. There were four types of back boards which were given a trial by each man.

1. Trapper Nelson - wire mesh and canvas covering.
2. Channel iron frame - wire mesh and canvas covering.
3. Close back frame.
4. Wire board.



On the Trapper Nelson frame and on the Channel iron frame, a wire mesh covering was used in place of the canvas back. The wire mesh, although very comfortable when the user was wearing a coat, galled the back when not covered with a coat. After the bending and general strain to which they were subjected, the wire tended to break which exposed sharp and pointed ends. On the basis of these findings, the wire mesh covering was deemed impractical.

The Channel iron frame, with a canvas covering, and the Trapper Nelson pack board, short and narrow in construction, were the two types of packs to which all the men gave first or second preference, from the standpoint of comfort and ease of carrying.

Trapper Nelson  
5 - first choice  
4 - second choice

Channel iron  
4 - first choice  
6 - second choice

Since these two types of packs have a similar shape, they are probably identical from the standpoint of comfort and ease of carrying. No costs have been obtained on either of these packs. The Trapper Nelson is a standard product and represents a more compact unit. The Channel iron, which can probably be made up somewhat cheaper than the Trapper Nelson, is not a standard article. The durability of the two types is also an unsettled question.

The Clack pack frame, used by the Forest Service for carrying fire motors, proved to be too rigid and was not comparable with the other types of boards from the standpoint of comfort and ease of carrying a load.

The fibre boards absorbed moisture to such a great extent as to cause them to warp completely out of shape, beyond use or repair. However, one fibre board, cut somewhat in the shape of a U with a little out of the center, was highly recommended by three men, but on the other hand there were five men who could not use it at all. Since it is advisable to get one standard type of board which can be used by all men, with minor adjustments, all the fibre boards were eliminated.

d. Canvas knapsack tank. These proved unsatisfactory since they failed to hold water.

e. Double nozzle. A double spray nozzle was devised for spraying dense concentrations. The greater amount of spray with a larger spread was obtained with no greater effort. Although this double nozzle accomplished a saving in time, such saving did not compensate for the additional gallonage used. The test was made on a total area of 4 acres.

Note: With the double-action pump and the pack board, the disagreeable and fatiguing factors of knapsack work have been greatly reduced.



On the Trapper Nelson frame and on the Channel iron frame, wire mesh covering was used in place of the canvas back. The wire mesh, although very comfortable when the user was wearing a coat, killed the back when not covered with a coat. After the banding and general strain to which they were subjected, the wire tended to break which exposed sharp and pointed ends. On the basis of these findings, the wire mesh covering was deemed impractical.

The Channel iron frame, with a canvas covering, and the Trapper Nelson back board, short and narrow in construction, were the two types of packs to which all the men gave first or second preference, from the standpoint of comfort and ease of carrying.

Trapper Nelson	Channel iron
5 - first choice	4 - first choice
4 - second choice	5 - second choice

Since these two types of packs have a similar shape, they are probably identical from the standpoint of comfort and ease of carrying. No coats have been obtained on either of these packs. The Trapper Nelson is a standard product and represents a more compact unit. The Channel iron, which can probably be made up somewhat steeper than the Trapper Nelson, is not a standard article. The suitability of the two types is also an unsettled question.

The Clark pack frame, used by the Forest Service for carrying fire motors, proved to be too rigid and was not comparable with the other types of boards from the standpoint of comfort and ease of carrying a load.

The fibre boards absorbed moisture to such a great extent as to cause them to warp completely out of shape, beyond use or repair. However, one fibre board, cut somewhat in the shape of a U with a little out of the center, was highly recommended by three men, but on the other hand there were five men who could not use it at all. Since it is advisable to get one standard type of board which can be used by all men, with minor adjustments, all the fibre boards were eliminated.

5. Canvas knapsack tank. These proved unsatisfactory since they failed to hold water.

e. Double nozzle. A double spray nozzle was devised for spraying dense concentrations. The greater amount of spray with a larger spread was obtained with no greater effort. Although this double nozzle accomplished a saving in time, such saving did not compensate for the additional gallonage used. The test was made on a total area of 4 acres.

Note: With the double-action pump and the back board, the disagreeable and fatiguing factors of knapsack work have been greatly reduced.



#### D. Training Project

Twelve men obtained a thorough training in chemical eradication which should enable them to take over field projects during the coming season. This training included work in all the various tasks in both knapsack and power operations, which provided one with a comprehensive knowledge of all the details of both methods. The training also included instruction in the various types of equipment and their use and repair. The problems and difficulties in chemical eradication were brought to the attention of twelve men and with the combined and concentrated thought of this group of permanent personnel, various improvements were made in methods of operation. Also ideas were formulated as to the proper organization of a field unit for chemical eradication.

#### RECOMMENDATIONS FOR FUTURE WORK

##### A. Knapsack Spraying.

1. Knapsack spraying for all concentrations of Ribes.
2. Trapper Nelson pack frames for carrying tanks.
3. Double-action pump having specifications of Brown pump with necessary alterations.
4. 2-ft.-1/8" iron extensions.
5. No. 111 Fine nozzle.
6. Individual block system of working areas, except under special conditions where 2-man crew is required.
7. One foreman to supervise the work of four to six knapsack sprayers.

##### B. Power Spraying.

1. Further experiment with power equipment on areas with heavy Ribes concentrations.
2. Individual block system of spraying.
3. Power units consisting of one foreman, one hoseman, one mechanic and ten sprayers with equipment mentioned.
4. 4-ft.-1/8" iron extensions and ball check.

In the training of personnel and the testing of new equipment, the project on Morro Creek accomplished its purpose. In the comparison of knapsack and power, the experiment indicated that knapsack spraying had the advantage in all Ribes concentrations. Certain factors, which necessarily accompany experimental work of the nature conducted on Morro Creek, subtract from the practical value of the results. Consequently the data received are an indication of the true situation rather than a basis for final decision between the merits of power and knapsack spraying. Therefore, it is advisable to continue work on a practical basis. The cost data on a season's work could then be compared with the cost of work done by all the knapsack units in operation during the same



Twelve men obtained a thorough training in chemical operations which should enable them to take over field projects during the coming season. The training included work in all the various trades in the knowledge of all the details of both methods. The training also included instruction in the various types of equipment and their use and repair. The problems and difficulties in chemical operations were brought to the attention of twelve men and with the combined and concerted thought of this group of permanent personnel, various improvements were made in methods of operation. Also ideas were formulated as to the proper organization of a field unit for chemical operations.

# RECOMMENDATIONS TO FIELD UNIT

## A. Knapack Spraying

1. Knapack spraying for all concentrations of flies.
2. Trigger bellows back frames for carrying tanks.
3. Double-action pump having specifications of pump head with necessary alterations.
4. 2-ft-1/8" iron extensions.
5. No. 11 1/2" nozzle.
6. Individual block system of work, areas, areas and a special condition where 3-man crew is required.
7. One person to supervise the work of four to six knapacks.

## B. Power Spraying

1. Further experiment with power sprayer on areas with heavy concentrations.
2. Individual block system of spraying.
3. Power unit consisting of one person, one hoseman, one mechanic and two sprayers with equipment mentioned.
4. 4-ft-1/8" iron extensions and bell check.

In the training of personnel and the test of new equipment, the project on Knapack spraying was completed. In the comparison of Knapack and power, the experiment indicated that Knapack spraying had the advantage in all flies concentrations. Certain factors, which necessarily accompany experimental work of the nature conducted on Knapack, subtract from the realistic value of the results. Consequently the data received are an indication of the true situation rather than a basis for final decision between the merits of power and Knapack spraying. Therefore, it is advisable to continue work on a critical basis. The cost data on a season's work could then be compared with the cost of work done by all the Knapack units in operation during the same



season. This will give a comparison on the basis of practical work for a final determination between the merits of the two units.

Since the spread in cost of spraying larger areas having dense concentrations of Ribes was not great the recommendation to use power spraying further on an experimental basis is fully justified. It is felt that much improvement in methods of power spraying can still be made and that cost of conducting such work may be reduced accordingly. Whether reductions in costs resulting from further experiment with power spraying will be great enough to offset those resulting from further improvement in knapsack methods of spraying is the only question yet to be solved. If such a reduction in power spraying costs cannot be made then the only alternative is to discard power spraying equipment and methods in favor of knapsack spraying.

Summary of work done during the season. The following is a summary of the work done during the season. It is divided into two parts, the first part dealing with the work done on the Ribes problem and the second part dealing with the work done on the other insects. The first part is divided into two sections, the first section dealing with the work done on the Ribes problem and the second section dealing with the work done on the other insects. The second part is divided into two sections, the first section dealing with the work done on the Ribes problem and the second section dealing with the work done on the other insects.

The Ribes problem was considered in detail during the season. It was found that the Ribes problem was a serious one and that it was necessary to take steps to control it. The following are the steps that were taken to control the Ribes problem: (1) the Ribes plants were sprayed with DDT; (2) the Ribes plants were sprayed with DDT; (3) the Ribes plants were sprayed with DDT; (4) the Ribes plants were sprayed with DDT; (5) the Ribes plants were sprayed with DDT; (6) the Ribes plants were sprayed with DDT; (7) the Ribes plants were sprayed with DDT; (8) the Ribes plants were sprayed with DDT; (9) the Ribes plants were sprayed with DDT; (10) the Ribes plants were sprayed with DDT.

The results of the work done during the season are as follows: (1) the Ribes problem was controlled; (2) the Ribes problem was controlled; (3) the Ribes problem was controlled; (4) the Ribes problem was controlled; (5) the Ribes problem was controlled; (6) the Ribes problem was controlled; (7) the Ribes problem was controlled; (8) the Ribes problem was controlled; (9) the Ribes problem was controlled; (10) the Ribes problem was controlled.

There is no further work to be done on the Ribes problem.



season. This will give a comparison on the basis of practical work for a final determination between the merits of the two units.

Since the spread in cost of spraying is great, it is necessary to have dense concentrations of Hives was not great the recommendation to use power spraying further on an experimental basis is fully justified. It is felt that much improvement in methods of power spraying can still be made and that cost of conducting such work may be reduced accordingly. Whether reductions in costs resulting from further experiment with power spraying will be great enough to offset those resulting from further improvement in knapsack methods of spraying is the only question that can be solved. If such a reduction in power spraying costs cannot be made then the only alternative is to discard power spraying equipment and methods in favor of knapsack spraying.



## EFFECTIVENESS OF CONTROL, 1929

By

H. N. Putnam

Associate Pathologist

The general purpose of this project is to determine the effectiveness of Ribes eradication in terms of pine protection. It is proposed to do this by means of the development of certain measuring sticks, or reference tables, to which the results of Ribes eradication can be referred and an intelligent estimate made in regard to the degree of protection afforded.

In conducting such studies several factors must be considered. The following list of individual reports represents what we have done in studying these factors:

Progress report on Cheekye plot studies, Cheekye, B. C.  
Newman Lake Plot, Washington.

Infection survey at Rhododendron, Oregon.

Long Meadow Creek infection area.

Eagle Creek infection area, Oregon.

Progress report on studies of relative susceptibility of

Pinus monticola, and P. strobus growing under western conditions.

General summary of work done in Project 4.2 and plans for future.

The general method employed in conducting permanent plot studies can be considered under three headings, which are self-explanatory. These are, (1) mapping and delimiting area of study, (2) plotting pines and Ribes, and (3) recording data on pines and Ribes. In the inspection of any plot already established only the third process is required.

The recording of data is done on the data sheets accompanying this report. Duplicates of all records are kept in the office. It may be noted that space is provided for five inspections for each tree, canker or Ribes.

There follow reports on the various studies already listed.



By

H. H. Probst

Associate Pathologist

The general purpose of this project is to determine the effectiveness of Ribes eradication in terms of pine protection. It is proposed to do this by means of the development of certain measuring studies, or techniques, to which the results of Ribes eradication can be referred and an intelligent estimate made in regard to the degree of protection afforded.

In conducting such studies several factors must be considered. The following list of individual reports represents what have been in studying these factors:

Progress report on Ribes eradication studies, Oregon, H. H. Probst, Newman Lake Pilot, Washington.  
Infection survey at Rhododendron, Oregon.  
Long Meadow Creek infection area.  
Early Creek infection area, Oregon.  
Progress report on studies of relative susceptibility of Ribes monticola, and P. glandulosa to Ribes eradication.  
General summary of work done in Project 4.2 and plans for future.

The general method employed in conducting permanent plot studies can be considered under three headings, which are self-explanatory. These are: (1) mapping and delimiting areas of study, (2) plotting Ribes and Ribes, and (3) recording data on Ribes and Ribes. In the inspection of any plot already established only the third process is required.

The recording of data is done on the data sheets accompanying this report. Duplicates of all records are kept in the office. It may be noted that space is provided for five inspections for each area, whether on Ribes.

There follow reports on the various studies already listed.



WF-BRC #65-3/15/29.

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UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY

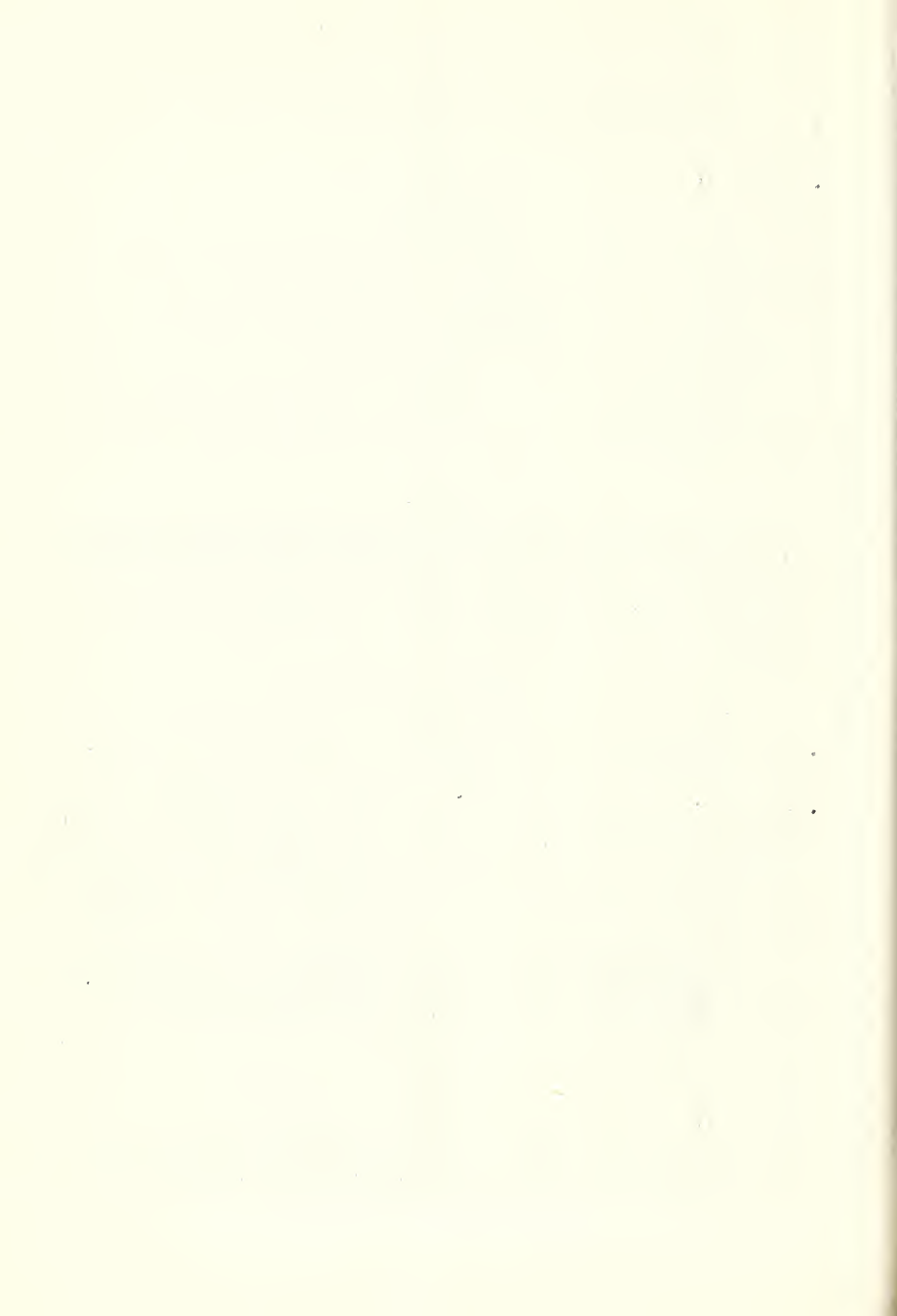
BULSTER-HUST CONTROL  
429 LYON BUILDING,  
SEATTLE, WASHINGTON.



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Canker Data.[illegible]







## PROGRESS REPORT ON CHEEKYE PLOT STUDIES, CHEEKYE, B. C.

By  
E. L. Joy  
Junior Forester

### INTRODUCTION

In the spring of 1923 a demonstration area was established at Cheekye, B. C. A circular plot with a 1,250-foot radius was surveyed and Ribes within this area were eradicated as completely as possible. Disease-free white-pine seedlings were then planted, three rows along each of 8 radii laid out at 45-degree intervals from north.

This area was burned over in the fall of 1925 necessitating the re-establishment of the plot in the spring of 1926. Again white-pine seedlings were planted along these 8 radii, this time one row along each radius instead of 3.

### PURPOSE

This plot was established in order to determine the maximum distance white-pine blister rust will spread from native Ribes to western white pines under field conditions in the West. Two other studies which are being conducted at the same time are (1) the rate of killing of white-pine seedlings by blister rust and (2) a determination of the survival of planted pines.

### WORK DONE AND RESULTS

The planted pines were examined in April and again in October, 1929. New stakes were set at one-chain intervals along each radius.

For the presentation of pine infection data secured in 1928, the planted pines were considered as being in three zones, namely, the zone outside the plot where Ribes were left, the protection zone or that strip 920 feet wide within the circumference, and the area protected which is a circular plot at the center having a 330-foot radius. This analysis showed that a 920-foot or even a 1,250-foot Ribes-free zone is not sufficient to protect pines from blister rust under conditions obtaining at Cheekye.

The same division into zones has been used for the purpose of analyzing the 1929 data. The difference between the average per cents of pines infected in each zone is not great as is shown in Table No. 1.



By  
R. B. Joy  
Junior Forester

# INTRODUCTION

In the spring of 1932 a demonstration area was established at Chesapeake, B. C. A circular plot with a 1,250-foot radius was surveyed and 8 radial lines were established at 45-degree intervals from north. Five white-pine seedlings were then planted, three rows along each of 3

This area was burned over in the fall of 1932 necessitating the re-establishment of the plot in the spring of 1933. Again white-pine seedlings were planted along these 8 radials, this time one row along each radial instead of 3.

## PURPOSE

This plot was established in order to determine the maximum distance white-pine blister rust will spread from native Ribes to western white pines under field conditions in the West. Two other studies which are being conducted at the same time are (1) the rate of killing of white-pine seedlings by blister rust and (2) a determination of the survival of planted pines.

## WORK DONE AND RESULTS

The planted pines were examined in April and again in October, 1933. New stakes were set at one-chain intervals along each radial.

For the presentation of pine infection data secured in 1933, the planted pines were considered as being in three zones, namely, the zone outside the plot where Ribes were last, the protection zone or that strip 250 feet wide within the circumference, and the area protected which is a circular plot at the center having a 250-foot radius. This analysis showed that a 250-foot or over a 1,250-foot Ribes-free zone is not sufficient to protect pines from blister rust under conditions obtaining at Chesapeake.

The same division into zones has been used for the purpose of analyzing the 1933 data. The difference between the average per cent of pines infected in each zone is not great as is shown in Table No. 1.



RECORD OF INFECTION OF PLANTED PINES ON CHEEKEYE PLOT, B.C., 1929

Radius	Outside Plot		Protection Zone (920 ft. in Width)			Area Protected (Inner Circle 330-ft. radius)			Total			
	Exam. Inf.	Pines Inf.	Pines Inf.	Exam. Inf.	Pines Inf.	Pines Inf.	Exam. Inf.	Pines Inf.	Pines Inf.	Per Cent Pines Inf.		
North	305	36	11.8	284	22	7.7	94	3	3.2	693	61	8.9
Northeast	187	18	9.6	256	16	6.3	94	5	5.3	537	39	7.3
East	85	5	5.9	264	29	11.0	96	9	9.4	445	43	9.7
Southeast	172	11	6.4	257	23	8.9	98	8	8.2	527	42	8.0
South	60	1	1.7	250	12	4.8	102	4	3.9	412	17	4.1
Southwest	118	10	8.5	259	13	5.0	93	6	6.5	470	29	6.2
West	64	5	7.8	220	32	14.5	100	12	12.0	384	49	12.8
Northwest	248	19	7.7	255	20	7.8	93	9	9.7	596	48	8.1
Totals & Averages	1,239	105	8.5	2,045	167	8.2	770	55	7.3	4,054	328	8.1



RECORD OF INFORMATION ON EXHAUST LINES ON CHESTER ELEC. P. CO. 1938

LINE NO. 1

Line	No.	Protected Zone				Unprotected Zone				Notes
		Line	Ext.	Int.	Line	Line	Ext.	Int.	Line	
1.1	833	833	833	833	833	833	833	833	833	833
1.2	834	834	834	834	834	834	834	834	834	834
1.3	835	835	835	835	835	835	835	835	835	835
1.4	836	836	836	836	836	836	836	836	836	836
1.5	837	837	837	837	837	837	837	837	837	837
1.6	838	838	838	838	838	838	838	838	838	838
1.7	839	839	839	839	839	839	839	839	839	839
1.8	840	840	840	840	840	840	840	840	840	840
1.9	841	841	841	841	841	841	841	841	841	841
1.10	842	842	842	842	842	842	842	842	842	842
1.11	843	843	843	843	843	843	843	843	843	843
1.12	844	844	844	844	844	844	844	844	844	844
1.13	845	845	845	845	845	845	845	845	845	845
1.14	846	846	846	846	846	846	846	846	846	846
1.15	847	847	847	847	847	847	847	847	847	847
1.16	848	848	848	848	848	848	848	848	848	848
1.17	849	849	849	849	849	849	849	849	849	849
1.18	850	850	850	850	850	850	850	850	850	850
1.19	851	851	851	851	851	851	851	851	851	851
1.20	852	852	852	852	852	852	852	852	852	852
1.21	853	853	853	853	853	853	853	853	853	853
1.22	854	854	854	854	854	854	854	854	854	854
1.23	855	855	855	855	855	855	855	855	855	855
1.24	856	856	856	856	856	856	856	856	856	856
1.25	857	857	857	857	857	857	857	857	857	857
1.26	858	858	858	858	858	858	858	858	858	858
1.27	859	859	859	859	859	859	859	859	859	859
1.28	860	860	860	860	860	860	860	860	860	860
1.29	861	861	861	861	861	861	861	861	861	861
1.30	862	862	862	862	862	862	862	862	862	862
1.31	863	863	863	863	863	863	863	863	863	863
1.32	864	864	864	864	864	864	864	864	864	864
1.33	865	865	865	865	865	865	865	865	865	865
1.34	866	866	866	866	866	866	866	866	866	866
1.35	867	867	867	867	867	867	867	867	867	867
1.36	868	868	868	868	868	868	868	868	868	868
1.37	869	869	869	869	869	869	869	869	869	869
1.38	870	870	870	870	870	870	870	870	870	870
1.39	871	871	871	871	871	871	871	871	871	871
1.40	872	872	872	872	872	872	872	872	872	872
1.41	873	873	873	873	873	873	873	873	873	873
1.42	874	874	874	874	874	874	874	874	874	874
1.43	875	875	875	875	875	875	875	875	875	875
1.44	876	876	876	876	876	876	876	876	876	876
1.45	877	877	877	877	877	877	877	877	877	877
1.46	878	878	878	878	878	878	878	878	878	878
1.47	879	879	879	879	879	879	879	879	879	879
1.48	880	880	880	880	880	880	880	880	880	880
1.49	881	881	881	881	881	881	881	881	881	881
1.50	882	882	882	882	882	882	882	882	882	882
1.51	883	883	883	883	883	883	883	883	883	883
1.52	884	884	884	884	884	884	884	884	884	884
1.53	885	885	885	885	885	885	885	885	885	885
1.54	886	886	886	886	886	886	886	886	886	886
1.55	887	887	887	887	887	887	887	887	887	887
1.56	888	888	888	888	888	888	888	888	888	888
1.57	889	889	889	889	889	889	889	889	889	889
1.58	890	890	890	890	890	890	890	890	890	890
1.59	891	891	891	891	891	891	891	891	891	891
1.60	892	892	892	892	892	892	892	892	892	892
1.61	893	893	893	893	893	893	893	893	893	893
1.62	894	894	894	894	894	894	894	894	894	894
1.63	895	895	895	895	895	895	895	895	895	895
1.64	896	896	896	896	896	896	896	896	896	896
1.65	897	897	897	897	897	897	897	897	897	897
1.66	898	898	898	898	898	898	898	898	898	898
1.67	899	899	899	899	899	899	899	899	899	899
1.68	900	900	900	900	900	900	900	900	900	900
1.69	901	901	901	901	901	901	901	901	901	901
1.70	902	902	902	902	902	902	902	902	902	902
1.71	903	903	903	903	903	903	903	903	903	903
1.72	904	904	904	904	904	904	904	904	904	904
1.73	905	905	905	905	905	905	905	905	905	905
1.74	906	906	906	906	906	906	906	906	906	906
1.75	907	907	907	907	907	907	907	907	907	907
1.76	908	908	908	908	908	908	908	908	908	908
1.77	909	909	909	909	909	909	909	909	909	909
1.78	910	910	910	910	910	910	910	910	910	910
1.79	911	911	911	911	911	911	911	911	911	911
1.80	912	912	912	912	912	912	912	912	912	912
1.81	913	913	913	913	913	913	913	913	913	913
1.82	914	914	914	914	914	914	914	914	914	914
1.83	915	915	915	915	915	915	915	915	915	915
1.84	916	916	916	916	916	916	916	916	916	916
1.85	917	917	917	917	917	917	917	917	917	917
1.86	918	918	918	918	918	918	918	918	918	918
1.87	919	919	919	919	919	919	919	919	919	919
1.88	920	920	920	920	920	920	920	920	920	920
1.89	921	921	921	921	921	921	921	921	921	921
1.90	922	922	922	922	922	922	922	922	922	922
1.91	923	923	923	923	923	923	923	923	923	923
1.92	924	924	924	924	924	924	924	924	924	924
1.93	925	925	925	925	925	925	925	925	925	925
1.94	926	926	926	926	926	926	926	926	926	926
1.95	927	927	927	927	927	927	927	927	927	927
1.96	928	928	928	928	928	928	928	928	928	928
1.97	929	929	929	929	929	929	929	929	929	929
1.98	930	930	930	930	930	930	930	930	930	930
1.99	931	931	931	931	931	931	931	931	931	931
2.00	932	932	932	932	932	932	932	932	932	932



Comparing the 1929 results with those of 1928, a marked increase in the per cent of pines infected in the zone outside the plot, where Ribes were not eradicated, is seen. Because of this increase, the 1929 figures show expected results with the greatest amount of infection occurring outside the plot and the least around the center. A comparison of the 1928 and 1929 results is shown in Table No. 2.

TABLE NO. 2

COMPARISON OF THE 1928 AND 1929 INFECTION BY ZONES

Year Examined	Per Cent Pines Infected			
	Outside Plot	Protection Zone (920 Feet Width)	Area Protected (Inner Circle 330 ft. Radius)	Average
1928	5.5	6.4	5.1	5.9
1929	8.5	8.2	7.3	8.1
Per Cent Increase	3.0	1.8	2.2	2.2

As early as the fall of 1928 it was noted that a few of the planted pines had been killed by blister rust. Examination in 1929, 3<sup>1</sup>/<sub>2</sub> years after planting, revealed the fact that this kill amounted to 12.8 per cent of the infected pines or 1 per cent of the total pines examined. A detailed account of this is given in the following table.

TABLE NO. 3

PLANTED PINES KILLED BY BLISTER RUST,  
CHEEKEYE PLOT B. C. FALL, 1929

Radius	Number Infected	Number Killed by Blister Rust	Per Cent Killed by Blister Rust
North	61	9	14.8
Northeast	39	5	12.8
East	43	6	14.0
Southeast	42	4	9.5
South	17	2	11.8
Southwest	29	1	3.4
West	49	7	14.3
Northwest	48	8	16.7
Total	328	42	12.8

A record has been kept of the survival of the planted pines. Table No. 4 shows the analysis of this 3-year record.



Comparing the 1928 results with those of 1929, it was noted that an increase in the per cent of pines infected in the same outside the plot, where pines were not eradicated, is seen. Because of this increase, the 1929 figures show expected results with the greatest amount of infection occurring outside the plot and the least around the center. A comparison of the 1928 and 1929 results is shown in Table No. 3.

TABLE NO. 3

COMPARISON OF THE 1928 AND 1929 INFECTION AT KOLAS

Year Examined	Plot	Citrus Zone (250 Feet Width)	Protection Area Protected (Inner Circle)	Per Cent Pines Infected (Average)
1928	5.5	8.4	3.1	5.9
1929	8.6	8.2	7.3	8.1
Per Cent Increase	5.0	1.8	2.2	2.2

As early as the fall of 1928 it was noted that a few of the planted pines had been killed by blister rust. Examination in 1929, 3 years after planting, revealed the fact that this kill amounted to 12.8 per cent of the infected pines or 1 per cent of the total pines examined. A detailed account of this is given in the following table.

TABLE NO. 4

PLANTED PINES KILLED BY BLISTER RUST  
CHERRY PLOT B. C. FALL, 1929

Native	Number Infected	Number Killed by Blister Rust	Per Cent Killed by Blister Rust
North	61	9	14.8
Northeast	39	5	12.8
East	43	6	14.0
Southeast	42	4	9.5
South	17	2	11.8
Southwest	22	1	4.5
West	40	7	17.5
Northwest	48	8	16.7
Total	328	42	12.8

A record has been kept of the survival of the planted pines. Table No. 4 shows the analysis of this 3-year record.



TABLE NO. 4

SURVIVAL OF PLANTED PINES, CHEEKEYE PLOT.

Radius	Pines Planted	Per Cent Pines Surviving		
	Spring 1926	Fall 1927	Fall 1928	Fall 1929
North	771	92.3	89.6	88.8
Northeast	640	89.0	84.6	83.9
East	528	88.0	85.0	84.4
Southeast	660	81.9	81.5	79.8
South	515	81.7	80.6	80.0
Southwest**	660	69.8	70.0	71.2
West**	447	79.0	80.3	80.5
Northwest	714*	85.4	85.4	83.4
Total	4,965	83.7	82.3	81.7

\*Corrected.

\*\*Annual survival increase due to the finding of pines formerly hidden by dense mass of down logs and brush caused by fire.

CONCLUSIONS

The fact, as determined in 1928, that a 1,250-foot Ribes-free protection zone is not sufficient in regions comparable to the Cheekye area, is further strengthened by the 1929 results. The plot at Cheekye is not large enough to be used for the determination of the maximum distance the disease will spread from Ribes to pines in that region.

The study to determine the rate of killing of white-pine seedlings is very important and should be continued on this area. From the results obtained to date, it appears that a large per cent of the white-pine planting stock used for reforestation will be killed by blister rust within the first ten years if planted in a region where infection is already established. In like manner, nurseries will suffer very heavy losses if they are not adequately protected.



## SURVIVAL OF PLANTED PINES, CHESTNUT PLOT

Region	Pines planted Spring 1928	Pines planted Fall 1927	Per Cent Pines Surviving Fall 1928
North	4,935	33.7	83.3
Northwest	7.4*	83.4	83.4
West*	44.7	79.0	80.3
Southeast*	66.0	89.8	70.0
South	31.5	81.7	80.5
Southeast	680	81.3	79.3
East	528	62.0	85.0
Northeast	840	83.0	86.3
North	771	82.3	86.8

\* Protected.

\*\* Annual survival increase due to the finding of pines formerly hidden by dense mass of down logs and brush caused by fire.

## CONCLUSIONS

The fact, as determined in 1928, that a 1,387-foot mixed-pine protection zone is not sufficient in regions comparable to the Chesapeake area, is further strengthened by the 1929 results. The plot at Chesapeake is not large enough to be used for the determination of the maximum distance the disease will spread from Pines to pines in that region.

The study to determine the rate of killing of white-pine seedlings is very important and should be continued on this area. From the results obtained to date, it appears that a large per cent of the white-pine planting stock used for reforestation will be killed by blight within the first ten years if planted in a region where infection is already established. In like manner, nurseries will suffer very heavy losses if they are not adequately protected.



## NEWMAN LAKE PLOT, WASHINGTON

By

R. E. Myers  
Agent

### PURPOSE

The purpose of this study is to determine the effect of Ribes lacustre as a factor in the intensification of white-pine blister rust after infection has become established on white pine.

### LOCATION

The plot is located 26 miles northeast of Spokane, Washington, one-half mile west of Newman Lake in townships 26 and 27 north, range 5 east, sections 4, 5, 32, 33. It can be reached by automobile in one hour via Trent Road and Newman Lake - Foothills highway.

### HISTORY

Blister-rust infection on pines was found on this area May 10, 1928 by R. L. MacLeod. Upon discovery of this infection intensive scouting was done but no other pine infection was found in this region.

### WORK PERFORMED.

Scouting, eradication of R. inerme, necessary surveys and some basic data-taking were done by permanent personnel of the office preceding the field season of 1929. From July 5 to August 25, R. E. Myers and F. L. Joy continued the work on the plot.

The work on this area began with the discovery of the rust on white pines and subsequent scouting of the area during May 1928. This was followed by a topographic survey of the area by E. L. Joy and F. B. Rowe completed October 31, 1928.

The work of surveying the plot into chain-square transects was completed in May 1929. 46.8 acres were thus surveyed and mapped showing the location of all culture features and boundaries of types.

The first eradication of the R. inerme was done May 6-8, 1929, by members of the permanent personnel of the office. 121,404 feet of live stem were pulled in 24 man-days. Three weeks later the area was re-eradicated of 4,487 feet of R. inerme. A third eradication was done during the time basic data were taken on 25.4 acres and 993 additional feet of live stem of R. inerme were pulled. It was noted that all bushes pulled were of small size and with only a few small leaves.



BY  
S. E. Mendenhall  
Agent

INTRODUCTION

The purpose of this study is to determine the extent of blister rust as a factor in the intensification of white-pine blister rust. After infection has become established on white pines.

LOCATION

The plot is located 3.5 miles northeast of Spooner, Wisconsin, one-half mile west of Newman Lake in townships 28 and 29 north, range 15 east, sections 4, 5, 32, 33. It can be reached by automobile in one hour via Trent Road and Newman Lake - Porterville highway.

METHOD

Blister-rust infection on pines was found in this area in 1928 by R. E. MacLeod. Upon discovery of this infection intensive scouting was done but no other pine infection was found in this region.

WORK PERFORMED

Scouting, eradication of R. lateralis, necessary surveys and some basic data-taking were done by permanent personnel of the office preceding the field season of 1929. From July 5 to August 20, E. E. Mendenhall and J. H. Jones continued the work on the plot.

The work on this area began with the discovery of R. lateralis on white pines and subsequent scouting of the area during May 1929. This was followed by a topographic survey of the area by E. E. Mendenhall and J. H. Jones completed October 31, 1928.

The work of surveying the plot into chain-square transects was completed in May 1929. 48.8 acres were thus surveyed and marked showing the location of all culture features and boundaries of types.

The first eradication of the R. lateralis was done May 8-9, 1929, by members of the permanent personnel of the office. 121,404 feet of 12 stems were pulled in 24 man-days. Three weeks later the area was re-scouted of 4,427 feet of R. lateralis. A third eradication was done during the same period. A total of 25.4 acres and 922 additional feet of live stems were pulled. It was noted that all bushes pulled were of small size and with only a few small leaves.



Basic data on R. lacustre and pines were taken during July and August on 25.4 acres. R. lacustre plants were re-examined for infection after August 15.

### RESULTS

The following table shows the Ribes conditions on that portion of the 25.4 acres of the plot studied.

TABLE NO. 1

#### RIBES FEET OF LIVE STEM PER ACRE ON 25.4 ACRES STUDIED

Species	Feet of Live Stem Per Acre	Status
<u>R. inerme</u>	3,115	Eradicated 1929
<u>R. lacustre</u>	2,118	Left for Study
Total	5,273	

In Table No. 2 is shown the details of infection on R. lacustre.

TABLE NO. 2

#### DETAILS OF R. LACUSTRE INFECTION, NEWMAN LAKE PLOT, 1929

Type of Information	<u>R. lacustre</u>
Total Bushes Examined	559.00
Per Cent Bushes Infected	1.07
Per Cent Leaves Per Infected Bush	0.25
Per Cent Infected Surface Per Infected Leaf	2.32
Per Cent Infected Surface Bearing Telia	55.10
Parts Per Million Total Leaf Surface Bearing Telia*	.34

\*The meaning of this ratio is that for one million square units of leaf surface there would be .34 square units of infected surface bearing telia.

It is evident from an examination of Table No. 2 that the R. lacustre at Newman Lake was very lightly infected. A high percentage of infected surface bore telia, but only a very small percentage of the total leaf surface was infected. This may be due chiefly to the small number of fruiting cankers on the area.

The following table is a compilation of data on the pines inspected on the plot classified according to D.E.H. classes and crown classes.



Basic data on *E. lacustris* and other water insects were taken from a study made August on 25.4 acres. *E. lacustris* larvae were re-examined for infection at 1st August 1932.

RESULTS

The following table shows the River conditions on first portion of the 25.4 acres of the plot studied.

TABLE NO. 1

RIVER PORT OF LIVE SPECIES - 1st AUGUST ON 25.4 ACRES STUDIED

Species	Port of Live	Species
<i>E. lacustris</i>	8.118	<i>E. lacustris</i>
<i>E. lacustris</i>	8.118	<i>E. lacustris</i>
<i>E. lacustris</i>	8.118	<i>E. lacustris</i>
<i>E. lacustris</i>	8.118	<i>E. lacustris</i>

In table No. 2 is shown the details of infection at *E. lacustris*.

TABLE NO. 2

DETAILS OF *E. LACUSTRIS* INFECTION, KILNMAN LAKE, 1932

Type of Infection	Percentage
Total Specimens Examined	288.000
Per Cent Specimens Infected	7.07
Per Cent Larvae for Infected Stage	0.28
Per Cent Infected Surface for Infected Stage	2.28
Per Cent Infected Surface Bearing Larvae	23.10
Per Cent Infected Surface Bearing Larvae	23.10

\*The meaning of this ratio is that for one million square units of leaf surface there would be 23.10 square units of infected surface bearing larvae.

It is evident from an examination of Table No. 2 that the *E. lacustris* at Kilnman Lake was very lightly infected. A high percentage of infected surface bore larvae, but only a very small percentage of total leaf surface was infected. This may be due chiefly to the small number of fruiting cankers on the trees.

The following table is a compilation of data on the trees infected on the plot classified according to T.B.M. classes and crown classes.



TABLE NO. 3

TOTAL NUMBER OF TREES INSPECTED AT NEWMAN LAKE 1929 CLASSIFIED  
ACCORDING TO INFECTION, CROWN CLASSES, AND DBH CLASSES

D.B.H. Classes Inches	Trees Not Infected				Infected Trees				Total Trees			
	Crown Classes				Crown Classes				Crown Classes			
	Dom.	Int.	Sup.	Total	Dom.	Int.	Sup.	Total	Dom.	Int.	Sup.	Total
0-.5	46	87	288	421	2	6	4	12	48	93	292	433
.6-1.5	15	36	86	137	9	4	3	16	24	40	89	153
1.6-2.5	12	22	39	73	13	7	2	22	25	29	41	95
2.6-3.5	9	12	9	30	1	1	0	2	10	13	9	32
3.6-4.5	8	1	0	9	6	1	0	7	14	2	0	16
4.6-5.5	5	4	0	10	2	0	0	2	8	4	0	12
5.6-6.5	2	1	0	3	4	0	0	4	6	1	0	7
6.6-7.5	1	0	0	1	3	0	0	3	4	0	0	4
Totals	99	163	422	684	40	19	9	68	139	182	431	752

Table No. 3 has been further analyzed in Table No. 4 to show the per cent of pines infected by crown and D. B. H. classes.

TABLE NO. 4

PERCENTAGE OF PINES INFECTED AT NEWMAN LAKE, 1929 BY  
CROWN CLASSES AND DBH CLASSES

D.B.H. Classes Inches	Per Cent of Trees Infected			
	Dominant	Intermediate	Suppressed	Total
0-.5	4.2	6.4	1.4	2.8
.6-1.5	37.5	10.0	3.4	10.5
1.6-2.5	52.0	24.1	4.9	23.2
2.6-3.5	10.0	7.7	0.0	6.2
3.6-4.5	42.9	50.0	-	43.7
4.6-5.5	25.0	0.0	-	16.7
5.6-6.5	66.7	0.0	-	57.1
6.6-7.5	75.0	-	-	75.0
Total	28.8	10.4	2.1	9.0

The above table indicates clearly that dominant trees are the most susceptible to blister rust and those of the intermediate and suppressed classes decidedly less susceptible. The dominant class is obviously composed of the thriftiest trees. It follows therefore, that blister rust will do the greatest damage to the most valuable trees in a stand.



ACCORDING TO THE CROWN CLASSES, AND NOT BY THE PERCENTAGE OF BIRCH INFESTED AT HANNA LAKE, 1932 BY

D.B.H. Classes	Trees Not Infested			Infested Trees			Total Trees		
	Dom.	Int.	Total	Dom.	Int.	Total	Dom.	Int.	Total
0-2	48	67	238	481	2	6	48	38	238
2-4	15	38	88	137	9	4	18	34	40
4-6	13	38	73	13	7	2	23	41	48
6-8	9	19	30	1	0	1	13	3	16
8-10	3	1	0	6	1	0	3	14	17
10-12	4	0	10	3	0	0	4	8	12
12-14	3	1	0	4	0	0	1	0	1
14-16	1	0	1	3	0	0	0	0	0
16-18	1	0	1	3	0	0	1	0	1
18-20	1	0	1	3	0	0	1	0	1
Total	103	163	482	684	40	19	63	130	193

Table No. 3 has been further analyzed in Table No. 4 to show per cent of birch infested by crown and D.B.H. classes.

TABLE NO. 4

PERCENTAGE OF BIRCH INFESTED AT HANNA LAKE, 1932 BY CROWN CLASSES AND D.B.H. CLASSES

D.B.H. Classes	Per Cent of Trees Infested		
	Dominant	Intermediate	Suppressed
0-2	4.3	8.1	1.4
2-4	37.5	10.0	8.4
4-6	32.0	24.1	4.0
6-8	10.0	7.7	0.0
8-10	42.9	50.0	-
10-12	33.3	0.0	-
12-14	33.3	0.0	-
14-16	75.0	-	-
16-18	75.0	-	-
18-20	75.0	-	-
Total	33.8	10.4	3.2

The above table indicates clearly that dominant trees are the most susceptible to blister rust and those of the intermediate and suppressed classes are less susceptible. The dominant class is obviously composed of the blightiest trees. It follows therefore, that blister rust will do the greatest damage to the most valuable trees in a stand.



In Tables No. 5 and 6 there are shown analyses of all cankers found on this plot.

TABLE NO. 5

ANALYSIS OF CANCERS 1929

Year of Growth	Number of Cankers								
	First Infected	Symptoms	Juvenile	Pycnia	Produced Aecia			Dead	Totals
					Once	Twice	Several Times		
1927	17	6	1						24
1926	187	93	3	1					284
1925	86	43	3				1		133
1924	32	24	5	1	1				63
1923	4	2	1		1	2		1	11
1922					1	1	6	2	10
1921						1	2	4	7
1920								1	1
1919									0
1918							1*		1
Totals	326	168	13	3	4	12		8	534**

\*This canker may possibly have originated prior to 1923 but the evidence is not sufficient to be conclusive.

\*\*Does not include 21 cankers found and removed May 1928. (See Table No. 6).

TABLE NO. 6

ANALYSIS OF CANCERS FOUND AND REMOVED MAY 1928

Year Growth	Number of Cankers				
	Produced Aecia			Dead	Totals
	Infected	Once	Twice		
1923	1	1			2
1922	1	14			15
1921		1			1
Unknown				3	3
Totals	2	16		3	21

It is evident from an examination of Tables No. 5 and 6 that infection probably originated during 1923 and that a large number of cankers



In Tables No. 5 and 6 there are shown analyses of all cancers found on this plot.

TABLE NO. 5

ANALYSIS OF CANCERS 1923

Year of Growth	Infected	First Symptom	Liver-	Number of Cancers				Dead Totals
				Prognosis		Several Times	Several	
				Once	Twice			
1927	17	2	1				24	
1928	127	23	3	1			264	
1929	88	43	3			1	153	
1934	32	24	2	1			63	
1935	4	2	1				11	
1936				1			10	
1937					1		7	
1938							1	
1939							0	
1940							1	
1941							1	
1942							1	
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2207							1	
2208							1	







1937. There were 42 cankers originating in 1937 and 57 in 1938, most of these in 1937, which gives the ratio of 1 to 1.35.

#### WORK TO BE DONE

1. Continuation of the present studies over a period of years.
2. Extension of the plot to the upper slope limits of the white-pine zone.
3. Development of measuring standards for first or middle stem estimates and ratio of Ribes leaf surface to actual area calculated.
4. Securing relative humidity records on the plot.

#### CONCLUSION

At Newman Lake two waves of infection were apparent, one in 1937 and the other in 1938. These occurred in the ratio of 1 in 1937 to 1.35 in 1938. This rate of increase in number of cankers of one wave over that preceding was comparable to 5.155 feet of live stem of *R. lacustris* and 2.111 feet of live stem of *R. lacustris* per acre. The *R. lacustris* was removed in the spring of 1939 before the effect of the remaining *R. lacustris* upon the rate of increase of pine infection and thus oblige an index to the effect of *R. lacustris* as a factor in the intensification of white-pine blister rust after infection has established itself on white pine.



## INFECTION SURVEY AT RHODODENDRON, OREGON

By

H. N. Putnam

Associate Pathologist

### PURPOSE

The purpose of the infection survey at Rhododendron was to obtain by means of a cruise of the area average infection conditions chargeable to average amount of different Ribes species.

### LOCATION

The area studied lies in the Rhododendron region, Multnomah County, Oregon, southwest of Mt. Hood, along Zigzag River and its tributaries 5 miles east of Brightwood in township 2 south, range 7 east, sections 29, 30, 31, 32, 33, and township 3 south, range 7 east, sections 2, 3, 4, 11, 12, 13.

### GENERAL SITUATION

In this region there are several good-sized streams flowing almost parallel in the same valley. Still Creek, Camp Creek, Henry Creek, and Zigzag River, occupy the same general valley at Rhododendron. White pines 31 to 40 years old occur growing mostly as suppressed individuals under an overstory of Douglas fir, cedar, and an occasional white pine. The pines are mostly limited to the valley floor.

### HISTORY OF INFECTION AND WORK DONE

In September, 1928, infection both on pines and Ribes species was found in this region for the first time by Goodding and assistants. In April, 1929, Goodding and Putnam re-examined the area and found a large number of young cankers of 1927 origin developing. In October, 1929, an intensive study of the area was made by E. L. Joy, R. E. Myers, C. M. Chapman, F. F. Staat and H. N. Putnam in cooperation with L. N. Goodding and M. C. Riley. Strips 1/2-chain wide were run across the valley. There were 19 such strips put in, 20 chains apart making a 2 1/2% cruise of the valley area. Data were taken on location of host plants and streams; on size and infection of Ribes species; and on age, height, crown class and number of cankers on pines.

There follow statistics derived from the data on all of the strips:

Length of valley covered.....	4 3/4 miles
Number of strips 20 chains apart.....	19
Width of strips.....	1/2 chain
Average length of strips.....	37+ chains



BY

H. M. PUTNAM

Associate Pathologist

BUMMERS

The purpose of the infection survey was to determine the amount of infection of Ribes species by means of a cruise of the area where infection is common.

LOCATION

The area studied lies in the Knappton region, Washington County, Oregon, southwest of Mt. Hood, along the River and its tributaries 5 miles east of Brightwood in township 36N, range 7 east, sections 33, 30, 31, 32, 33, and township 3 south, range 7 east, sections 2, 3, 4, 11, 12, 13.

GENERAL SITUATION

In this region there are several good-sized streams flowing almost parallel in the same valley. Still Creek, Green Creek, and Nigger River, occupy the same general valley at Knappton. White pine 31 to 40 years old occur growing mostly as scattered individuals under an overstory of Douglas fir, cedar, and an occasional white pine. The pines are mostly limited to the valley floor.

HISTORY OF INFECTION AND WORK DONE

In September, 1938, infection both on pines and Ribes species was found in this region for the first time by Gooding and assistants. In April, 1939, Gooding and Putnam re-examined the area and found a large number of young cankers of 1937 origin developing. In October, 1939, an intensive study of the area was made by E. L. Joy, H. M. Putnam, C. M. Chapman, T. E. Stett and R. M. Putnam in cooperation with W. L. Gooding and W. C. Miller. Strips 1/2-chain wide were run across the valley. There were 19 such strips but in 20 chains apart making a 380' cross of the valley area. Data were taken on location of host plants and streams; on all infection of Ribes species; and on age, height, crown class and number of cankers on pines.

There follow statistics derived from the data on all of the strips.

Length of valley covered..... 19 miles  
Number of strips 50 chains apart..... 19  
Width of strips..... 1/2 chain  
Average length of strips..... 38 + chains



Acres in strips.....	35.17
Total pines inspected.....	698.0
Total pines infected.....	94.0
Per cent of pines infected.....	13.5
Waves of infection occurred in 1923 and 1927	
Total cankers of 1923 origin.....	125.0
" " originating since 1923.....	1378.0
Average number cankers per infected tree.....	16.0
Largest number of cankers on one tree.....	962.0
Number of pines per acre.....	19.8
Number of <u>R. bracteosum</u> locations per acre.....	1.7
" " <u>R. lacustre</u> " " ".....	5.6
" " <u>R. sanguineum</u> " " ".....	.6
Total number of Ribes locations per acre.....	7.9
Feet live stem of <u>R. bracteosum</u> per acre.....	419.0
" " " " <u>R. lacustre</u> " ".....	527.0
" " " " <u>R. sanguineum</u> " ".....	125.0
" " " " all Ribes " ".....	1071.0
Per cent of <u>R. bracteosum</u> locations infected.....	26.2
" " " <u>R. lacustre</u> " ".....	2.0
Average per cent leaves infected per infected bush of <u>R. bracteosum</u> .....	35.6
Average per cent leaves infected per infected bush of <u>R. lacustre</u> .....	10.8
No infection found on <u>R. sanguineum</u> .	

The chief value of this study, the statistics on which are shown above, lies in the fact that it constitutes a quantitative and impartial statement of pine infection chargeable to a certain amount of Ribes live stem per acre. On this particular area the rust has been present since 1923. A second wave occurred in 1927. From the data secured by this 2 $\frac{1}{2}$ % cruise, it is evident that the association of pines with over a thousand feet of live stem of Ribes species per acre almost entirely along streams resulted in 13.5% of the pines becoming infected.

Since the strips studied were not contiguous it is impossible to draw any conclusions relative to the source of infection on any one pine. However, it is believed that such a study gives reliable information on the average pine infection over a large infected area at a relatively small expenditure of time.

If such studies could be made of many infections thruout the country, it is believed that information of value could be obtained relative to the amount of pine infection caused by association of pines with different amounts of Ribes leafage. This information could be used in evaluating Ribes eradication in terms of pine protection until more exact figures are secured from permanent plot studies.

In compiling statistics mentioned in this paper, no attempt has been made to show the distances of spread from Ribes to pines. It is sufficient for the present to observe that the pines found infected were usually close to R. bracteosum locations.



Acres in strips.....	13.3
Total pines inspected.....	13.3
Total pines infected.....	13.3
Per cent of pines infected.....	100
Waves of infection occurred in 1923 and 1927	
Total number of 1923 origin.....	13.3
originating since 1923.....	13.3
Average number cankers per infected tree.....	13.3
Largest number of cankers on one tree.....	13.3
Number of pines per acre.....	13.3
Number of <u>R. praticense</u> locations per acre.....	13.3
" " " <u>R. lacustris</u> .....	13.3
" " " <u>R. canadense</u> .....	13.3
Total number of Ribes locations per acre.....	13.3
Per cent of <u>R. praticense</u> locations per acre.....	13.3
" " " <u>R. lacustris</u> .....	13.3
" " " <u>R. canadense</u> .....	13.3
" " " all Ribes.....	13.3
Per cent of <u>R. praticense</u> locations infected.....	13.3
" " " <u>R. lacustris</u> .....	13.3
Average per cent leaves infected per infected bush of	
<u>R. praticense</u> .....	13.3
Average per cent leaves infected per infected bush of	
<u>R. lacustris</u> .....	13.3
No infection found on <u>R. canadense</u> .....	

The chief value of this study, the statistics on which are set above, lies in the fact that it constitutes a quantitative and important statement of the infection of Ribes in a certain amount of Ribes in a certain area. On this particular area the results have been presented in a form per acre. A second wave occurred in 1927. From the data secured by this study, it is evident that the association of Ribes with over a thousand feet of live stem of Ribes species per acre almost entirely alone after resulted in 13.3% of the pines becoming infected.

Since the strips studied were not contiguous it is impossible to draw any conclusions relative to the source of infection on any one. However, it is believed that such a study gives reliable information on average pine infection over a large infected area at a relatively small expenditure of time.

If such studies could be made of many locations throughout the country, it is believed that information of value could be obtained relative to the amount of pine infection caused by association of Ribes with the Ribes amounts of Ribes species. This information could be used in various ways. Ribes eradication in form of pine protection would be most effective where Ribes are secured from permanent pine studies.

In compiling statistics mentioned in this paper, no attempt has been made to show the dimensions of spread from Ribes to pines. It is sufficient for the present to observe that the Ribes found in the area are usually close to R. praticense locations.



## LONG MEADOW CREEK INFECTION AREA, IDAHO

By

H. N. Putnam

Associate Pathologist

### PURPOSE

The purpose of the study started at Long Meadow Creek is to determine the effectiveness of *Ribes* eradication in the control of blister rust under conditions that exist there.

### LOCATION

The infection is located near the junction of Long Meadow and Three Bear creeks, Clearwater County, Idaho, township 39 north, range 1 east, section 14.

### SITUATION AND WORK DONE

This infection was first found on August 21, 1929, by C. M. Chapman and R. K. Pierson. Subsequent scouting showed that infection covered about 60 acres supporting a dense stand of white pine 21 to 40 years old. Two centers of infection apparently originating in 1923 were found. One of these on Long Meadow Creek, 7 chains above creek junction had approximately 100 trees with cankers originating in 1923. The other spot infection of 1923 origin was on the north-facing slope of Three Bear Creek, 5 chains west of junction. Here it was estimated that there were 75 trees with cankers originating in 1923. Pines with cankers originating in 1926 and 1927 were found extending up Three Bear Creek for a distance of 35 chains; up Long Meadow Creek for 20 chains; and below the junction of the creeks for 4 chains.

It was estimated that on the 60 acres of infected area there were 1,500 trees per acre with an average of 5% of them infected. On this basis it is judged that there were 4,500 trees infected on the total area.

There were found no concentrations of *Ribes* on or near the infected area. *Ribes lacustre* and *R. viscosissimum* occurred at the rate of 30 to 40 bushes per acre, not particularly concentrated along the streams, but scattered through the stand. The nearest *R. reticulare* found was three miles away, not associated with the rust.

Approximately 300 acres on and around the infected area were eradicated of *Ribes* by the eradication forces. A check of this eradication work showed the following average *Ribes* conditions left:



LONG MOUNTAIN NATIONAL FOREST, INDIANA

By

E. A. Peterson  
Associate Entomologist

PURPOSE

The purpose of the study started at Long Meadow Creek is to determine the effectiveness of a disease eradication in the control of spruce budworm under conditions that exist here.

LOCATION

The infection is located near the junction of Long Meadow and Three Bear creeks, Champaign County, Indiana, Township 36 North, Range 1 East, section 14.

STORY OF THE INFECTION

This infection was first found on March 21, 1939, by C. W. Chapman and E. A. Peterson. Subsequent scouting showed that infection covered about 80 acres supporting a dense stand of white pine 20 to 30 years old. Two centers of infection apparently originating in 1937 were found. One of these on Long Meadow Creek, 7 chains above creek junction had approximately 100 trees with cankers originating in 1937. The other spot infection of 1938 origin was on the north-facing slope of Three Bear Creek, 5 chains west of junction. Here it was estimated that there were 75 trees with cankers originating in 1938. Pines with cankers originating in 1938 and 1937 were found extending up Three Bear Creek for a distance of 35 chains; up Long Meadow Creek for 30 chains; and below the junction of the creeks for 4 chains.

It was estimated that on the 80 acres of infected area there were 1,500 trees per acre with an average of 3% of them infected. The basis it is judged that there were 4,500 trees infected on the total area.

There were found no concentrations of Ribes on or near the infected area. Ribes lacustre and R. viscosissimum occurred at the rate of 30 to 40 branches per acre, not particularly concentrated along the stream but scattered through the stand. The nearest R. cynosbati found was three miles away, not associated with the rest.

Approximately 300 acres on and around the infected area were eradicated of Ribes by the eradication forcees. A check of the eradicated area showed the following average Ribes conditions last:



<u>R. lacustre</u> bushes.....	22	per acre
<u>R. lacustre</u> F.L.S.....	145	" "
<u>R. viscosissimum</u> bushes.....	7	" "
<u>R. viscosissimum</u> F.L.S.....	85	" "
Total <u>Ribes</u> bushes.....	29	" "
Total <u>Ribes</u> F.L.S.....	230	" "

A plot was started late in the season including both centers of infection. An area of 4.1 acres was surveyed into square chains and the Ribes present before eradication plotted and recorded. Information on pines was delayed until next year, owing to the need for Ribes information before the Ribes were eradicated. In Table No. 1 is shown the details of Ribes infection on the plot.

TABLE NO. 1

RIBES INFECTION STUDIED ON LONG MEADOW PLOT, IDAHO

September 1 - 15, 1929

Type of Information	<u>R. viscosissimum</u>	<u>R. lacustre</u>
Bushes per acre before eradication	3	19
Feet live stem per acre before eradication	27	1,881
Total bushes examined	12	78
Per cent bushes infected	83.3	46.2
Per cent leaves infected per infected bush	75.4	22.0
Per cent infection per infected leaf	14.3	4.8
Per cent infected surface bearing telia	19.2	39.3
Per cent total leaf surface bearing telia	1.72	.19
Ratio of telial production for equal leafage units	9	1

It may be observed that in Table No. 1 the percentages of infection in the various steps mentioned are decidedly higher for R. viscosissimum than for R. lacustre except in the case of the per cent of infected surface bearing telia. In this instance the telial production per infected surface of R. lacustre is over twice that of R. viscosissimum. This is unusual since past investigations have shown R. lacustre to be the lowest of all Ribes species studied in the production of telia per infected surface. A study of relative humidity in connection with Ribes infection may shed light on this situation.

The Ribes examined on the infection area were almost entirely in the half or full shade. Lachmund has reported his studies on relative susceptibility of R. viscosissimum and R. lacustre in the Western Blister-







Rust News Letter of December 15, 1928, Volume 3, No. 12. He shows the ratio of telial production for equal amounts of leafage of the two *Ribes* species in the shade to be *R. viscosissimum* 4.7, *R. lacustre* 1. He does not show a value for *R. viscosissimum* in the half shade. The findings at Long Meadow show the relationship to be *R. viscosissimum* 9, *R. lacustre* 1. Thus the findings in eastern B. C. where Lachmund conducted his studies, and the findings at Long Meadow are not dissimilar, so far as the relation in susceptibility of the two *Ribes* species are concerned.

However, the high percentage of telial development per infected surface of *R. lacustre* is unusual, and points to the effect of some other factor or factors. To determine if this is due to a more susceptible strain of *R. lacustre* a few plants heavily infected in 1929 at Long Meadow were transplanted in a defoliated condition to Newman Lake, where *R. lacustre* did not show severe infection. Future inspections at Newman Lake will shed light on this point.

To determine the effect of relative humidity at Long Meadow as a possible contributing cause of the severe infection of *R. lacustre*, it is intended to set up a hygrothermograph to measure relative humidity in this region.

Considerable time will be spent in establishing a plot at Long Meadow in 1930.



East News Letter of December 13, 1932, Volume 3, No. 12. It shows the ratio of total production for equal amounts of leafage of the two species in the shade to be *E. viscosissimum* 4.7, *E. laevigatum* 1.0. It does not show a value for *E. viscosissimum* in the half shade. The findings show the relationship to be *E. viscosissimum* 3.7, *E. laevigatum* 1.0. Thus the findings in eastern E. O. where *E. laevigatum* conducted its life and the findings at Long Meadow are not dissimilar, as far as the relation in susceptibility of the two species are concerned.

However, the high percentage of total development per leaflets surface of *E. laevigatum* is unusual, and points to the effect of some factor or factors. To determine if this is due to a more susceptible strain of *E. laevigatum* a few plants heavily infested in 1930 at Long Meadow were transplanted in a isolated condition to Newnan Lake, where *E. laevigatum* did not show severe infestation. Future investigations at Newnan Lake will shed light on this point.

To determine the effect of relative humidity at Long Meadow as a possible contributing cause of the severe infestation of *E. laevigatum*, it is intended to set up a hygrothermograph to measure relative humidity in this region.

Considerable time will be spent in establishing a plot at Long Meadow in 1930.



## EAGLE CREEK INFECTION AREA, OREGON

By  
H. N. Putnam  
Associate Pathologist

### PURPOSE

The purpose of a study which might be conducted at Eagle Creek, Oregon would be to determine the effect of stream type eradication upon the action of the rust in Oregon.

### LOCATION

This area lies on Eagle Creek, Hood River County, Oregon,  $5\frac{1}{2}$  to  $7\frac{1}{2}$  miles by trail south of the Columbia River Highway, northwest of Mt. Hood in township 1 north, range 8 east, sections 6, 8, 9.

### GENERAL SITUATION

The area of infection lies along Eagle Creek for a distance of two miles. The apparent center of infection is on an alluvial fan on the east side of Eagle Creek seven to seven and one-half miles from the Columbia River Highway, and is reached by trail. The area supports a stand 11 to 20 years old of Douglas fir, with scattered white pines present.

### HISTORY OF INFECTION

Pine infection here was found for the first time by Lyle on September 16, 1929. Ribes bracteosum infection was found in this general vicinity in 1927, and on Eagle Creek in 1928. The area was further examined on October 18, 1929, by Goodding and Putnam.

### RIBES CONDITIONS

No concentrations of Ribes were found on or near the area. There are scattering R. bracteosum bushes along the creek, but not in abundance. R. sanguineum was found distributed among the pines, but not in great amounts. The bushes were from 10 to 50% defoliated. One out of 15 R. bracteosum bushes examined was found with 5% of its leaves infected. No infection was found on 25 R. sanguineum examined.

### PINE INFECTION

There were 50 pines examined, 10 of which were infected. An analysis of 13 cankers on 6 trees showed that probably infection originated in 1925 or 1926, with a secondary wave apparent in 1927. The infected pines were not particularly concentrated in the immediate vicinity of R. bracteosum, but were scattered from 50 to 600 feet distant.



H. A. Putnam  
Associate Pathologist

PURPOSE

The purpose of a study which might be conducted at Eagle Creek, Oregon would be to determine the effect of stream flow conditions upon the action of the pest in Oregon.

LOCATION

This area lies on Eagle Creek, Hood River County, Oregon, 2 1/2 miles by trail south of the Columbia River Highway, northwest of Mt. Hood in township 1 north, range 2 west, section 2, 8, 9.

CURRENT SITUATION

The area of infection lies along Eagle Creek for a distance of two miles. The apparent center of infection is on an alluvial fan on the east side of Eagle Creek seven to seven and one-half miles from the Columbia River Highway, and is reached by trail. The area encompasses a 11 to 20 years old Douglas fir, with scattered white firs present.

HISTORY OF INFECTION

White infection here was found for the first time by Lyle on September 18, 1929. Ribes praeoxanthum infection was found in this general vicinity in 1927, and on Eagle Creek in 1928. The area was further examined on October 18, 1929, by Gooding and Putnam.

RIBES SPECIES

No concentrations of Ribes were found on or near the area. The are scattered R. praeoxanthum bushes along the creek, but not in abundance. R. sanguineum was found distributed among the firs, but not in great numbers. The bushes were from 10 to 500 ft. high. One out of 12 R. praeoxanthum bushes examined was found with 3% of the leaves infected. No infection was found on 25 R. sanguineum examined.

THE INFECTION

There were 80 firs examined, 10 of which were infected. An analysis of 12 samples on 5 trees showed that probably infection originated in 1925 or 1926, with a secondary wave present in 1927. The infected firs were not particularly concentrated in the immediate vicinity of R. praeoxanthum, but were scattered from 50 to 500 feet distant.



## RECOMMENDATIONS

It is believed that a worth while study of the value of stream type eradication in Oregon could be made here by the removal of R. bracteosum for one mile in each direction, and the establishment of a permanent study plot possibly 5 chains wide along the creek and 15 chains long extending up the slope at right angles to stream flow. The effect of R. sanguineum on the rust could then be studied. Pines and Ribes should be plotted and examined at periodic intervals. It is planned to establish such a plot in the spring of 1930.

### RELATIVE SUSCEPTIBILITY OF PINE AND RIBES TO RUST IN THE SOUTH OREGON AND WEST OREGON WATERSHEDS

Species	Number of Plots	Number of Plots		Number of Plots	Number of Plots	Number of Plots
		South Oregon	West Oregon	South Oregon	West Oregon	South Oregon
<u>P. contorta</u>	70	60	10	10	10	10
<u>P. ponderosa</u>	5	1	4	1	1	1
<u>P. jeffreyi</u>	74	60	14	10	10	10
<u>P. resinosa</u>	5	1	4	1	1	1
<u>Pinus</u>	164	112	52	10	10	10
<u>Ribes</u>	10	5	5	10	10	10

It is evident from this table that the relative susceptibility of the various species of pine and ribes to rust in the South Oregon and West Oregon watersheds is as follows: P. ponderosa is the most susceptible, followed by P. jeffreyi, P. contorta, P. resinosa, and Ribes. The relative susceptibility of the various species of pine and ribes to rust in the South Oregon and West Oregon watersheds is as follows: P. ponderosa is the most susceptible, followed by P. jeffreyi, P. contorta, P. resinosa, and Ribes.

In 1929 the relative susceptibility of the various species of pine and ribes to rust in the South Oregon and West Oregon watersheds is as follows: P. ponderosa is the most susceptible, followed by P. jeffreyi, P. contorta, P. resinosa, and Ribes.



## RECOMMENDATIONS

It is believed that a worthwhile study of the value of such type eradication in Oregon could be made here by the removal of precipitous for one mile in each direction and the establishment of permanent study plots possibly 5 chains wide along the crest and long extending up the slope at right angles to stream flow. The of R. sanguineus on the tract could then be studied. Since and since should be plotted and examined at periodic intervals. It is recommended to establish such a plot in the spring of 1930.



PROGRESS REPORT ON STUDIES OF RELATIVE SUSCEPTIBILITY  
OF PINUS MONTICOLA AND PINUS STROBUS GROWING UNDER  
WESTERN CONDITIONS

By

H. N. Putnam  
Associate Pathologist

This paper constitutes a progress report on two plots, one at Buck Creek, Snohomish County, and one at Pysht, Clallam County, Washington, both established in the spring of 1928. This study was first reported in the 1928 Annual Report of this office. The plots were inspected in the fall of 1929. Table No. 1 gives the results of the inspection.

TABLE NO. 1

RELATIVE SUSCEPTIBILITY OF PINUS MONTICOLA AND PINUS STROBUS ON THE  
BUCK CREEK AND PYSHT AREAS, WASHINGTON. OCTOBER 1929

Plots	White Pine Species	Number of Trees		Per Cent Trees Infected	Average Cankers Per Infected Tree		Cankers Per 1000 Ft. of Needle Stem
		Examined	Infected		Total	Trees	
Buck Creek	P. monticola	70	50	71.4	13.8	9.8	17.8
	P. strobus	5	1	20.0	4.0	0.8	1.9
Pysht	P. monticola	74	69	93.2	14.0	13.0	53.2
	P. strobus	5	4	80.0	12.5	10.0	5.8
Combined Plots	P. monticola	144	119	82.6	13.9	11.5	29.1
	P. strobus	10	5	50.0	10.8	5.4	5.1

It is evident from Table No. 1 that considering both plots together, for equal volumes of foliage there were found nearly 6 times as many cankers on P. monticola as on P. strobus indicating that P. strobus is much more resistant to the rust than is P. monticola when both are exposed to the same sporidial sources. This fact is of importance not only in considering the two species with reference to reforestation needs, but also it is useful in interpreting eastern infection information for use in western work.

In 1928 the ratio of cankers for equal volumes of foliage on these same plots was 3 cankers on P. monticola to 1 canker on P. strobus.



PROGRESS REPORT ON STUDIES OF RELATIVE SUSCEPTIBILITY OF  
OF PINUS MONTECOLA AND PINUS STROBUS GRADUS VARIETAL  
WESTERN CONDITIONS

BY  
H. W. FRIEDMAN  
Associate Pathologist

This paper constitutes a progress report on two plots, one at Buck Creek, Snohomish County, and one at Lyall, Grays Harbor County, Washington. The study was first reported in the 1938 Annual Report of this office. The plots were established in the fall of 1939. Table No. 1 gives the results of the investigation.

TABLE NO. 1

RELATIVE SUSCEPTIBILITY OF PINUS MONTECOLA AND PINUS STROBUS TO  
BUCK CREEK AND LYALL PLOTS, WASHINGTON, OCTOBER 1939

Plots	White Pine Species	Number of Trees		Per Cent Trees Infected	Average Cankers Per Tree	
		Exam- ined	Infected		Infected	Total
Buck	P. monticola	70	50	71.4	13.3	9.8
Lyall	P. strobus	3	1	33.3	4.0	0.8
Combined	P. monticola	74	51	68.8	14.0	13.0
	P. strobus	3	1	33.3	10.0	1.0
	P. monticola	144	119	82.6	13.3	11.8
	P. strobus	10	5	50.0	10.8	3.4

It is evident from Table No. 1 that considering both plots together, for equal volumes of foliage there were found nearly 8 times as many cankers on P. monticola as on P. strobus indicating that P. monticola was much more resistant to the test than P. strobus. This fact is of importance not only in considering the two species with reference to resistance to infection, but also it is useful in determining infection for use in western work.

In 1938 the ratio of cankers for equal volumes of foliage on these same plots was 3 cankers on P. monticola to 1 canker on P. strobus.



GENERAL SUMMARY OF WORK DONE IN PROJECT 4.2  
AND PLANS FOR THE FUTURE

By

H. N. Putnam  
Associate Pathologist

Results of studies, with reference to the relationship of Ribes quantities and cankers produced, are shown in Table No. 1.

TABLE NO. 1

NUMBER OF CANKERS CHARGEABLE TO FEET OF  
LIVE STEM OF RIBES BY SPECIES

Area	Acres Studied	Cankers Originating		Feet of Live Stem Per Acre Of					Total Ribes
		In 1923	Since 1923	R. pet.	R. bract.	R. iner.	R. sang.	R. lac.	
Buck Creek Washington	1.6	25	660		936			2,253	3,189
Rhododendron Oregon	35.17	125	1,378		419		125	527	1,071
Deep Creek Idaho	?	3	2	11,944				5,314	17,258
N. Fork Reed's Creek, Idaho	?	0	22	24,266				9,422	33,688
Newman Lake Washington	25.4	43	512			3,155		2,118	5,273
Long Meadow Idaho	4.1	5*	123				R. vis. 27	1,881	1,908

\*Numbers of cankers represented here are only those which were classified as to year of origin and stage of canker development.

An examination of Table No. 1 brings out the obvious fact that factors other than the ability to produce telia are very influential in causing pine infection. Observations at different points have indicated that relative humidity is an important factor in producing pine infection. It is intended that relative humidity readings will be taken on every plot studied in the future.

It is believed that the index to the effect of all factors applying to any area is the rate of increase in number of cankers produced in one wave of infection over that of the preceding wave. Hence the real purpose of Ribes eradication is to reduce the rate of increase in number



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H. W. Hutton  
Associate Pathologist

Results of studies, with reference to the relationship of  
quantities and cankers produced, are shown in Table No. 1.

TABLE NO. 1

NUMBER OF CANKERS OBSERVABLE TO THE  
LIVE STAGE OF RIBES IN SPECIES

Area	Acres studied	Since 1933	Can- kers observed	Per cent of live plants infected	Per cent of live plants infected	Per cent of live plants infected	Per cent of live plants infected	Per cent of live plants infected	Per cent of live plants infected
Long Meadow	4.1	5*	158						
Washington	28.4	48	518						
Newman Lake									
Creek, Idaho	1	0	32	34	32				
York Road's									
Idaho	7	3	3	11	94				
Deep Creek									
Idaho	35.17	125	1,378						
Rhododendron									
Washington	1.8	35	580						
Back Creek									
Idaho									

\*Numbers of cankers represented here are only those which were  
found at the year of origin and stage of cancer development.

The examination of Table No. 1 brings out the obvious fact  
factors other than the ability to produce telia are very influential in  
causing pine infection. Observations at different points have indicated  
that relative humidity is an important factor in producing pine infection.  
It is intended that relative humidity readings will be taken on every  
study in the future.

It is believed that the index to the effect of all factors  
applying to any area is the rate of infection in number of cankers produced  
in one wave of infection over that of the preceding year. The purpose  
of Ribes eradication is to reduce the rate of increase in cankers.



of cankers to a minimum. Absolute removal of all Ribes from an area, would of course reduce the rate of increase to zero.

We are striving to shape our studies toward the development of two reference tables. One of these would contain data relative to the rate of increase in number of cankers of one wave of infection over the preceding wave as indicated by a correlation of relative humidity and quantities of a given *Ribes* species. The other reference table would show the average number of cankers required to render trees of different size classes unmerchantable.

With such information on a sufficient basis, it should be possible to intelligently estimate the effectiveness of eradication on a given area in terms of pine protection.

The costs of project 4.2 are shown in the "Checking Report". The estimated total charged to a study of infection plots in 1929 is \$8,317.26.



of tankers to a minimum. Absolute removal of all flies from an area would of course reduce the rate of increase to zero.

We are striving to shed our studies toward the development of two reference tables. One of these would contain data relative to the rate of increase in number of tankers of one wave of infection over the preceding wave as indicated by a correlation of relative mortality and quantities of a given flies species. The other reference table would give the average number of tankers required to render mass of different size classes unmanageable.

With such information on a sufficient basis, it should be possible to intelligently estimate the effectiveness of restriction on a given area in terms of pine protection.

The costs of project 4.2 are shown in the "Operating Report". The estimated total charged to a study of infection plots in 1939 is \$8,317.38.



## EDUCATIONAL WORK - 1929

By

R. L. MacLeod,  
Agent

### INTRODUCTION

The educational program of the Western Office of Blister-Rust-Control has been carried on largely in those western states where the protection of white pine is an economic concern and in which blister-rust control is being developed. Work in other regions has consisted in giving attention to definite requests for blister-rust material and information.

Educational work in Montana, Oregon and California has been carried on by the state leader concerned, with the aid of specimens, display material and bulletins supplied from the Spokane Office. As this work is treated in the reports of the state leaders this report deals only with the educational work of the Spokane Office.

### PURPOSE

The purpose of educational work is to give to blister-rust workers a comprehensive view of the relation of the projects and up-to-date information on the general progress and results of the work; to bring to the administrators of forest lands, both public and private, a realization of the menace to white pine which blister rust constitutes and of the necessity for action in preserving both actual and potential timber assets and to supply those not directly concerned with the control of blister rust with some knowledge of the disease and of the progress and value of control efforts in order to build up general interest in and support of the control program.

### SUMMARY OF WORK

The educational work accomplished during 1929 falls under two general headings: 1. preparation of material; 2. distribution of material and information.

#### A. Preparation of Material.

Blister-Rust Specimens. One of the most valuable aids to the dissemination of blister-rust information is the distribution of actual specimens of the disease. A sound conception of the importance and practicability of control work is predicated on a foundational knowledge of the disease itself which can well be provided through the illustrative use of specimens.



Dr. J. H. Henshaw,  
Agent

# INTRODUCTION

The educational program of the Bureau of Plant Industry has been carried on in regular intervals in those western states where the protection of white pine is an economic concern and in which the protection of white pine is being developed. Work in other regions has been concentrated in giving attention to definite requests for information, material and information.

Educational work in Montana, Oregon and California has been carried on by the state leader concerned, with the aid of a committee, display material and bulletins supplied from the Bureau Office. A wide work is treated in the reports of the state leaders and report deals only with the educational work of the Bureau Office.

## PURPOSE

The purpose of educational work is to give to planters and workers a comprehensive view of the relation of the project and to locate information on the general progress and results of the project. To bring to the administrators of forest lands, both public and private, a realization of the need to give white pine blight more consideration and of the necessity for action in preserving both natural and planted timber assets and to supply those not directly concerned with the control of blight with some knowledge of the disease and of the progress and value of control efforts in order to bring general interest in and support of the control program.

## SCOPE

The educational work accomplished during 1950 falls under two general headings: 1. preparation of material; 2. distribution of material and information.

### A. Preparation of Material

Blister-blast Specimens. One of the most valuable aids in the dissemination of blister-blast information is the distribution of specimens of the disease. A sound conception of the importance and practicality of control work is illustrated on a formal and informal basis of the disease itself which can well be provided through the use of five use of specimens.



Cankers showing the early development and aecial stages of the disease on pine were preserved in individual test tubes. 475 of these specimens were used in demonstration boxes, 55 aecial stage specimens were sent to state leaders and 60 to schools and colleges.

Several trunk cankers, 18 and 24 inches long, in large glass jars and a number of the larger branch cankers in one-quart jars were used in demonstration work.

Several hundred diseased Ribes leaves showing both the uredinial and telial stages were gathered. Of these, two hundred of each stage were used in demonstration boxes, 80 individual mounts of uredinial and 50 of telial specimens were supplied to state leaders and 45 of each stage were sent to educational institutions. A sufficient quantity of these specimens has been left on hand to supply educational needs during the first half of 1930.

A large quantity of uredinial and telial specimens was preserved in test tubes, one tube of each stage, containing 20 to 25 leaves, to be sent to the universities of the West for microscopic examination of spores, in the classroom.

All specimens sent out from the Spokane Office, whether for display or for class study, have been so treated as to preclude the possibility of viable spores or mycelium remaining in the material. At the time of collection, the specimens are immersed in the standard killing solutions used by the Office of Blister-Rust Control, composed as follows:

Solution for pine specimens - 2 per cent formaldehyde, 10 per cent glycerine and 88 per cent water.

Solution for Ribes specimens - 5 per cent formaldehyde, 5 per cent glacial acetic acid and 90 per cent of a 50 per cent solution of alcohol.

Display tubes containing aecial or pycnial material are tightly corked and sealed with wax. Ribes mounts of uredinial or telial material are tightly sealed at the edges with tape, the material having previously been disinfected with the killing solution. By these means, every possible precaution is taken to prevent dissemination of the rust.

**Demonstration Boxes.** Two types of demonstration box have been designed during the past two years; a 3-specimen box showing the three most easily recognizable stages of the disease on Ribes and pine, the uredinial, telial and aecial stages and a 7-specimen box showing all stages of the disease on both hosts.



Plants showing the early symptoms of the disease were preserved in formalin test tubes. These specimens were used in demonstration boxes, 30 test tubes each. Specimens were sent to state boards and to the National and International

covered trunk cankers, 15 and 24 inches long, in 1924. Glass jars and a number of the larger wooden cankers in demonstration work.

Several hundred of these glass leaves showing both the uninfected and infected stages were prepared. In 1924, two hundred of each stage were used in demonstration boxes, 30 leaves each. In 1925 and 1926 of dried leaves were supplied to state boards. In 1927 of each stage were sent to educational institutions. In 1928 of each stage were sent to educational institutions. In 1929 of each stage were sent to educational institutions. In 1930 of each stage were sent to educational institutions.

A large quantity of uninfected and infected specimens were preserved in test tubes, one tube of each stage, containing 10 to 25 leaves, to be sent to the universities of the test for the examination of leaves, in the laboratory.

All specimens sent out from the Bureau of Plant Industry, Washington, for display or for class study, have been so treated as to make the possibility of visible losses or injuries remaining in the material. At the time of collection, the specimens are treated with the standard killing solutions used by the Office of Plant Industry, as follows:

Solution for pine specimens - 5 per cent formalin, 10 per cent glycerine and 85 per cent water.  
Solution for fir specimens - 5 per cent formalin, 10 per cent glycerine and 85 per cent water.  
50 per cent solution of alcohol.

Display cases containing sections of infected material are tightly covered and sealed with wax. All the cankers of uninfected material are tightly sealed with the same wax. The material having previously been disinfected with the killing solution. By these means, every possible precaution is taken to prevent transmission of the virus.

Demonstration boxes. Two types of demonstration boxes have been designed during the past two years: a 3-inch by 6-inch by 1-inch box, most easily recognized, stages of the disease in leaves and twigs, the uninfected, infected and sealed boxes and a 7-inch by 10-inch by 1-inch box, stages of the disease on both twigs.



The 3-specimen box was made up in 1928 when 40 were used by state leaders and 24 sent out from the Spokane Office. During 1929, 14 of these boxes were supplied to state leaders, 36 to Forest Service officials and 3 to schools. In the fall of the year 75 of these boxes were made up for use during 1930.

The 7-specimen box was developed in the fall of 1928 when 12 were made up and 7 distributed to state leaders and collaborators. During 1929, 28 of these boxes were sent to state leaders, 17 to administrators of forest lands, 6 to educational institutions and 9 to blister-rust camps. 20 of these 7-specimen boxes remain on hand and a greater supply will be made up as soon as an additional supply of material can be gathered in the spring of 1930.

Photography. Photography plays an important part in educational work in that a supply of good photographs is prerequisite to the making of lantern slides, posters, bulletins and other demonstration and publicity material.

During the winter months photographic work consists in the reduction of maps, charts and tables for the annual report, for publication and for lantern slides. Early in the year, 35 pictures were taken for the 1928 annual report and 26 graphs were reproduced for publication.

During the field season an effort is made to procure an up-to-date record of the work of each project. Pictures are taken of working areas, methods in use and, so far as practicable, of results. In addition Ribes, white-pine stands and general forest types are photographed. During 1929 there were added to the western files 175 field photographs from which a number of lantern slides and enlargements will be procured.

Blister-Rust Albums. Albums showing the important features of the several phases of blister-rust work, with explanatory legends, were prepared in the spring of the year. Eight of these albums were made up and used in blister-rust camps during the summer.

Sets of Photographs and Bulletins. A set of photographs was prepared showing the life cycle and spread of the rust, damage to pine and methods of control. Comprehensive legends were written giving up-to-date information supplementary to that contained in bulletins. These sets of photographs with bulletins were included with demonstration material for universities and were sent to students requesting information for theses on blister rust.







Bulletins. The bulletins used in educational work during the past year were:

Miscellaneous Publication No. 23 - general bulletin dealing with blister rust.

Reprint from "The Timberman" - White-Pine Blister Rust - Its Cause and Control in the West.

Miscellaneous Publication No. 27 - Black Currant Spreads White-Pine Blister Rust.

Technical Bulletin No. 87 - White-pine Blister Rust: A Comparison of European with North American Conditions.

Farmers' Bulletin No. 1398 - Currants and Gooseberries - Their Culture and Relation to White-Pine Blister Rust.

Questions and Answers - dealing with blister-rust control.

Five-winged Panels. Early in 1929 the posters on the five-winged panels were revised. Five new posters were designed and two copies of each made up. One copy was kept for demonstration work, the other sent to Washington where copies were made for all panels. These posters were received in the fall of the year and are being used in the revision of panels in the possession of state leaders and collaborators.

Photographs, 8"x10", were taken of the posters on the five-winged panel and arranged in the same way, i.e., as a panel. It is planned to have these smaller panels printed in Washington and distributed with demonstration material for schools.

Blister-Rust Posters. A large poster, 26"x38", was made up with photographs showing the life cycle and spread of blister rust, damage pictures, control methods and values at stake. Printing of borders, heads and legends will be done in Washington. These posters should be available in the fall of 1930 for state leaders, Forest Supervisors' offices and educational institutions.

#### B. Distribution of Material and Information.

Blister-Rust Personnel. An important phase of educational work is the dissemination of news to blister-rust workers in order that they may comprehend fully the importance of all developments in the ramified field of blister-rust activities.



Bitter-Rust Personnel. An important phase of educational work in the field of bitter-rust activities is the dissemination of news to bitter-rust workers in order that they may comprehend fully the importance of all developments in the national field of bitter-rust activities.

4. Distribution of Material and Information.

Superior, offices and educational institutions. Should be available in the fall of 1933 for state leaders, tonight borders, heads and legends will be done in Washington. Printed of damage pictures, control methods and values at stake. Printed of Bitter-Rust Posters. A large poster, 36"x58", was made up with photographs showing the life cycle and spread of bitter rust. Distributed with demonstration material for schools.

Planned to have these smaller panels printed in Washington and a single panel and arranged in the same way, 1.6', is a panel. It is a photograph, 36"x10", were taken of the posters on the five-

collaborators. used in the revision of panels in the possession of at its leaders and these posters were received in the fall of the year and are being other sent to Washington where copies were made for all panels. copies of each made up. One copy was kept for demonstration work, the five new posters were revised. Five new posters were designed in two five-winged panels. Early in 1932 the posters on the five-

Questions and answers - dealing with bitter-rust control.

Farmer's Bulletin No. 1326 - Corns and Possibilities - Their Culture and Relation to White-Lime Bitter Rust.

White-Lime Bitter Rust. Miscellaneous Publication No. 27 - Black Current Spots and Its Causes and Control in the West.

Reprint from "The Limberman" - White-Lime Bitter Rust - Miscellaneous Publication No. 28 - General Bitter Rust and Its Control.

Miscellaneous Publication No. 29 - General Bitter Rust and Its Control.

White-Lime Bitter Rust. The Bulletin used in educational work during the past year were:



The Western Blister-Rust News Letter was initiated to fill this need and was continued throughout 1929. Articles were written on blister rust and associated forestry subjects, the former dealing with plans, aims and periodic results of the various projects. Articles were contributed by practically all of the permanent personnel. The news letter averaged 9 pages in length and was issued to a mailing list of 60, most of whom are concerned directly with blister-rust work.

During the summer months the mailing list was expanded to include all temporary employees. This summer news letter averaged 15 pages in length. Impressions of the men were given in prose and poetry. Interspersed with these items were more serious articles giving the purpose, plans and results of the work.

Each blister-rust camp was supplied with bulletins, one album and one 7-specimen demonstration box which proved of value in helping the temporary men to comprehend the scope and importance of the work.

U. S. Forest Service. 7-specimen boxes were supplied to the seven forest supervisors and 3-specimen boxes to the 36 ranger stations on the Clearwater, Coeur d'Alene, Kaniksu, Pend Oreille, Selway and St. Joe National Forests. One 7-specimen box was sent to the Supervisor, Nezperce National Forest and one to the Director, Priest River Experiment Station. Copies of blister-rust bulletins were supplied with each demonstration box. This demonstration material should prove useful in aiding the Forest Service personnel to understand and recognize blister rust. It has been used also by some forest supervisors in display work.

In addition, some demonstration work was done with the Forest Service personnel. A lantern slide talk was given at the guard training school of the Pend Oreille National Forest in May. During the summer 6 supervisors' offices and 11 ranger stations were visited with demonstration material comprising a five-winged panel, photographs and large trunk cankers.

Timber Protective Associations. The secretaries of the Clearwater, Coeur d'Alene, Pend Oreille, Potlatch and Priest Lake Timber Protective Associations were supplied with 7-specimen boxes and bulletins. The secretaries of the Potlatch and Clearwater Associations were visited with demonstration material, the large trunk cankers being of particular interest in demonstrating potential damage to white pine. The Chief Fire Warden of the Potlatch Association was supplied with a 7-specimen box and bulletins. These boxes will be sent to the fire wardens of all associations when an additional supply is made up.



The eastern Blister-bush News Letter was initiated to fill this need and was continued throughout 1930. Articles and editorials on blister rust and associated forestry subjects, and forestry news with plans, aims and periodic results of the various projects. Articles were contributed by practically all of the permanent personnel. The news letter covered 9 pages in length and was issued to a mailing list of 32, most of whom are concerned with blister rust work.

During the summer months the mailing list was expanded to include all temporary employees. This summer news letter averaged 15 pages in length. Impressions of the men were given in prose and poetry. Interwoven with these items were more serious articles giving the purpose, plans and results of the work.

Each blister-rust camp was supplied with a collection of blister rust and one Y-acid demonstration box which proved of value in helping the temporary men to comprehend the scope and importance of the work.

U. S. Forest Service. Demonstration boxes were supplied to the seven forest supervisors and 100 forest guards to use in their stations. On the Clearwater, Coeur d'Alene, Lemhi, Kootenai, Selkirk, and St. Joe National Forests. One Y-acid demonstration box was sent to the Supervisor, Nezperce National Forest and one to the District, Priest River Experiment Station. Copies of blister-rust bulletins were applied with each demonstration box. This demonstration material should prove useful in aiding the forest guards to understand and recognize blister rust. It has been used also by forest supervisors in display work.

In addition, some demonstration work was done with the forest service personnel. A bulletin with text and pictures was given at the guard training school of the Clearwater National Forest in May. During the summer 8 supervisors' offices and 10 guard stations were visited with demonstration material comprising a 10-page pamphlet, photographs and large trunk cankers.

Timber Protective Associations. The secretaries of the Clearwater, Coeur d'Alene, Lemhi, Kootenai, Selkirk, and St. Joe National Forest Timber Protective Associations were supplied with Y-acid demonstration boxes and bulletins. The secretaries of the Kootenai and Clearwater Associations were visited with demonstration material. The large trunk cankers being of particular interest in demonstrating potential damage to white pine. The other five members of the Kootenai Association were supplied with a Y-acid demonstration box and bulletins. These boxes will be sent to the 10 members of the Clearwater Association when an additional supply is made up.



National Parks. Bulletins and 7-specimen boxes were sent to the superintendents of eight national parks in the West. Five of these boxes were sent to state leaders for transmittal to the superintendents of Crater, General Grant, Lassen, Sequoia and Yosemite National Parks. Three boxes with bulletins were sent from this office to the superintendents of Glacier, Rocky Mountain and Yellowstone National Parks. Rainier National Park had been supplied with two 3-specimen boxes and bulletins in 1928.

Educational Institutions. A set of demonstration material was prepared for the universities of the West. This set includes one 7-specimen demonstration box, 6 individual mounts of both uredinial and telial material for classroom use, 2 test tubes containing preserved uredinial and telial material for microscopic examination and one set of photographs and bulletins.

This material was supplied to the School of Forestry and Department of Plant Pathology, University of Idaho; Agricultural Department, Southern Branch, University of Idaho; Departments of Forestry and Plant Pathology, Washington State College and the School of Forestry, University of Washington. This material is useful in supplying a cumulative number of students with a fundamental knowledge of blister rust. It will be used also at various times in extension work displays.

In addition to the material noted above one 7-specimen box and bulletins were supplied the Department of Forestry, Utah Agricultural College; 6 aecial specimens, 3 first stage cankers on pine and bulletins were sent to Cornell University and sets of photographs and bulletins were supplied to ten students requesting information on blister rust.

Superintendents and teachers in 5 public schools were supplied with three 3-specimen boxes, 12 aecial, 6 uredinial and 6 telial specimens and copies of all bulletins.

General Publicity. Articles were run in newspapers in Spokane, Washington and in Coeur d'Alene, Elk River, Lewiston and Orofino, Idaho. Five cuts with legends and bulletins were sent to the Chief of the Montana State Agricultural Department for publicity work.

Blister-rust talks, illustrated with lantern slides were given before a nature study club and the Hoo Hoo Club in Spokane, Washington.



National Parks. Bulletins and -specimen boxes were sent to the superintendents of eight national parks in the West. These boxes were sent to state leaders for transmission to the superintendents of Glacier, Grand Canyon, Grand Teton, and Yellowstone National Parks. Three boxes with bulletins were sent from the office to the superintendents of Glacier, Rocky Mountain and Yellowstone National Parks. Further National Parks had been supplied with two 3-specimen boxes and bulletins in 1932.

Educational Institutions. A list of educational institutions was prepared for the universities of the West. This list included the 3-specimen demonstration box, 6 individual mounts of both botanical and animal material for classroom use, 12 sets of photographs and one set of photographs and bulletins.

This material was supplied to the School of Forestry and Department of Plant Pathology, University of Idaho; Department of Forestry, Southern Branch, University of Idaho; Department of Forestry and Plant Pathology, Washington State College and the School of Forestry, University of Washington. This material is being supplied to a cumulative number of students with a view to extending its use. It will be used also at various times in extension work throughout the West.

In addition to the material noted above one 3-specimen box and bulletins were supplied to the Department of Forestry, Utah Agricultural College; 6 special specimens, 3 first stage camera on film and bulletins were sent to Cornell University and sets of photo plates and bulletins were supplied to ten students requesting information in bulletins.

Supplies and materials in 5 public schools were supplied with three 3-specimen boxes, 12 special, 6 individual and 6 bulletins specimens and copies of all bulletins.

General Circulation. Articles were sent to newspapers in Spokane, Washington and in Coeur d'Alene, ID. River, Lewiston and Orofino, Idaho. Five sets with legends and bulletins were sent to the Chief of the Montana State Agricultural Experiment Station in Bozeman, Montana.

Bulletin - not a native study club and the Red Fox Club in Washington.



Blister-rust demonstrations were prepared for the Sportmen's and Tourists' Fair at Spokane, Washington, in May, the Bonner County Fair at Sandpoint, Idaho in September and the Clearwater County Fair at Orofino, Idaho in October. Demonstration material comprised actual specimens of white pine, Ribes and blister rust, one five-winged panel, enlarged photographs, large trunk cankers and colored lantern slides which proved quite effective in attracting attention to the display and in telling the story of blister rust and its control.

#### RECOMMENDATIONS

To further the carrying out of plans formulated for educational work in 1930 it is recommended that:

1. An automatic slide projector be procured. This would greatly increase the effectiveness of county fair demonstrations.
2. Batteries be provided for the projection machine now in use. This would facilitate educational work in blister-rust camps and Forest Service stations where no electricity is available.







REPORT OF THE COMMISSIONER OF PUBLIC WORKS  
FOR THE YEAR 1922

Federal Expenditures

The following tabulation of Federal expenditures for the periods January - June, 1922, and July - December 1922, appearing by project, the expenditures of the Western Office of District Engineer.

Expenditures have been classified under the several items shown in the tabulation for the purpose of better understanding of expense charged to each project in preparing project cost statements. To further this objective office records show the classification of all expenditures by object.







TABLE NO. 1.

FEDERAL EXPENDITURES, WESTERN OFFICE OF BLISTER-MIST CONTROL,  
January 1, 1929 - June 30, 1929.

Project	Salaries	Expenses	Total	Subsistence Expenses	Railroad, Pullman, Stage, etc.	Personally Owned Autos	Operation Government Ford Trucks	Other Transportation Expenses	Express, Freight, Trucking and Tacking	Supplies and Equipment	Miscellaneous Expenses
1.1 Cultivated black current location and eradication in cooperation with states -											
1.1.1 - Montana	\$ 150.00	-	\$ 150.00	-	-	-	-	-	-	-	-
1.1.2 - California	528.33	\$ 23.66	551.99	\$ 10.35	-	-	-	\$ 1.00	\$ 1.71	-	\$ 10.60
1.2 Inspection of transported host plants in cooperation with the Plant Quarantine & Control Administration	567.50	9.05	576.55	-	-	-	\$ 9.05	-	-	-	-
1.3 Sanitation of Nurseries -											
1.3.1 - Oregon	50.00	-	50.00	-	-	-	-	-	-	-	-
2.2 Developing methods of Ribes eradication -											
2.2.2-1 - Method studies of chemical eradication	965.20	3,372.70	4,337.90	311.91	-	\$ 17.32	8.24	.10	365.95	\$2,317.36	352.87
2.2.2-2 - Experimental re-eradication Borvill, Idaho	156.34	267.20	423.54	106.69	-	-	20.85	-	17.66	193.26	28.74
2.2.2-3 - Experimental re-eradication Clear Fork National Forest	568.33	465.82	1,034.15	199.39	-	-	5.00	-	33.39	194.58	31.46
2.3 Developing and testing Bicides -											
2.3.1 - Laboratory investigations	5,603.15	1,649.48	7,252.63	445.53	\$ 128.14	90.30	77.50	41.90	93.20	570.63	192.75
2.3.2 - Field tests	340.75	769.64	1,110.40	145.55	-	11.62	110.67	-	3.43	473.36	17.31
2.4 Studies in Ribes ecology -											
2.4.1 - Idaho	3,329.58	850.03	4,179.61	328.66	153.49	201.46	31.82	12.90	4.65	146.75	8.35
2.4.2 - Oregon	29.00	56.37	85.37	52.22	12.05	30.69	-	.16	-	-	.33
2.4.3 - California	419.29	492.93	912.22	130.29	15.67	-	49.86	1.72	7.22	123.29	22.17
3.0 Application of chemical eradication of Ribes -											
3.0.2 - Idaho	4,176.31	3,258.37	7,434.68	1,363.50	1,205.37	241.43	61.24	46.30	42.31	98.26	198.74
3.1 Control Reconnaisance on Federal lands -											
3.1.1 - Montana	260.00	-	260.00	-	-	-	-	-	-	-	-
3.1.2 - Idaho	822.46	32.15	854.61	-	-	-	-	-	-	-	32.15
3.1.3 - California	1,762.74	602.37	2,365.11	367.82	51.23	94.55	89.88	4.89	8.64	134.87	51.67
3.2 Ribes eradication - Federal lands											
3.2.1 - Montana	1,312.50	512.09	1,824.59	15.15	-	73.99	-	-	22.82	389.16	11.17
3.2.2 - Idaho	2,069.11	103.27	2,172.38	10.50	-	-	5.06	-	-	8.60	85.11
3.2.3 - Washington	36.00	34.43	70.43	34.05	-	-	-	.40	-	-	-
3.2.4 - Oregon	1,091.83	728.33	1,820.16	222.03	12.06	295.68	-	21.31	21.77	121.10	38.40
3.2.5 - California	3,133.65	1,706.65	4,840.30	857.85	66.23	93.61	72.54	12.95	55.55	326.34	134.41
3.3 Control demonstrations on private lands -											
3.3.2 - Idaho	1,221.66	7.45	1,229.11	-	-	-	-	-	-	-	7.45
3.4 Cooperative Ribes eradication -											
3.4.2 - Priest Lake Timber Protective Association	332.32	51.64	383.96	6.56	-	-	.65	-	-	-	44.24
3.4.2.1 - Clearwater Timber Protective Association	995.66	6,149.16	7,144.81	1,283.97	118.82	-	43.40	-	402.68	4,139.17	101.91
3.4.2.2 - Foltz Timber Protective Association	1,056.64	4,603.22	5,659.86	97.02	-	-	30.45	.39	163.14	4,179.49	132.73
4.1 Spread of the rust -											
4.1.1 - Montana	-	24.70	24.70	-	-	-	-	-	1.80	20.92	2.51
4.1.2 - Idaho	205.66	115.37	321.03	51.00	-	38.79	-	-	1.80	21.03	7.16
4.1.3 - Washington	133.33	24.50	157.83	-	-	-	-	-	1.20	20.90	2.85
4.1.4 - Oregon	-	24.61	24.61	-	-	-	-	-	1.21	20.87	2.52
4.1.5 - British Columbia	133.33	-	133.33	-	-	-	-	-	-	-	-
4.2 Damage to pine	2,456.52	545.47	3,002.00	174.38	34.48	170.80	31.81	1.64	4.65	122.08	5.63
4.2.1 Educational work -											
4.2.1.1 - Spokane Office	2,721.48	896.30	3,617.78	360.39	174.42	64.33	-	8.85	47.78	136.46	105.07
4.2.1.2 Maintenance of field office and miscellaneous expense -											
4.2.1.2.1 - Supervision	2,299.98	767.72	3,067.70	303.36	583.10	-	-	18.10	-	-	1.18
4.2.1.2.2 - Office maintenance	6,479.95	1,735.55	8,215.50	2.68	39.58	-	-	6.48	-	-	1,698.97
4.2.1.2.3 - Miscellaneous supplies and services paid on I/A	-	776.43	776.43	-	-	12.25	2.46	-	57.57	323.03	280.12
4.2.1.2.4 - Miscellaneous supplies paid in Washington	-	92.01	92.01	-	-	-	-	-	21.73	70.28	-
Total	\$45,663.34	\$31,012.38	\$76,675.72	\$6,810.61	\$2,546.06	\$1,406.82	\$644.85	\$177.94	\$1,414.46	\$14,291.79	\$3,724.86

\*Includes cost of Atlantic for entire field season of 1929.

\*\*See also separate summary of expenditures from association funds for these cooperative projects.

# Stationery and other office supplies in the amount of \$45.63 furnished this office from Washington, D. C., the cost of which is allocated to the "General Control Program" and is not included in the total for this project.

## Includes operation of U.S.C. truck for projects 2.2.2-2, 2.2.2-3, 3.4.2-1, 3.4.2-2, 3.4.2-3.

Outstanding freight and express items for various projects, estimated at \$150.00, not included.

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TABLE NO. 2.

**FEDERAL EXPENDITURES, WESTERN OFFICE OF BLISTER-RUST CONTROL,  
July 1, 1929 - December 31, 1929.**

Projects	Salaries	Expenses	Total	Subsistence Expenses	Railroad, Post Office, Stage, etc.	Personally Owned Autos	Operation Government Ford Trucks	Other Transportation Expenses	Express, Freight, and Packing	Supplies and Equipment	Miscellaneous Expenses
1.1 Cultivated black current location and eradication in cooperation with states											
1.15 - California	\$ 2,194.83	\$ 2,684.65	\$ 4,879.48	\$ 1,247.81	\$ 44.07	\$ 1,342.74	-	\$ 2.40	\$ 3.72	\$ 13.90	\$ 30.01
2.2 Developing methods of Ribes eradication											
2.22-1 - Method studies of chemical eradication	5,039.90	2,126.40	7,165.30	800.51	29.92	55.94	\$ 74.00	.48	235.98	563.30	357.27
2.22-2 - Experimental re-eradication, Bayhill, Idaho	2,699.95	678.60	3,378.55	501.60	5.23	57.12	20.25	.10	26.95	22.41	44.94
2.23 - Experimental re-eradication, Cour d'Alene National Forest	3,068.09	977.02	4,045.11	733.79	34.00	-	-	-	48.30	124.80	36.13
2.3 Developing and testing Ribicides	4,445.27	2,395.56	6,840.83	711.45	569.43	317.13	77.06	25.16	54.97	478.72	167.64
2.3-1 - Laboratory investigations	1,666.46	1,492.55	3,159.01	522.60	-	43.00	15.00	19.00	41.52	324.14	51.62
2.4 Studies in Ribes ecology	3,672.60	1,354.19	5,026.79	651.53	102.57	524.30	20.98	32.65	-	18.63	13.42
2.45 - California	1,713.93	696.80	2,409.83	443.83	31.61	-	61.61	.70	8.36	117.73	32.96
3.1 Control reconnaissance on Federal lands	2,091.66	575.00	2,666.66	388.88	23.91	-	81.20	.45	5.59	13.05	61.92
3.2 Ribes eradication on Federal lands											
3.21 - Montana	2,529.52	1,029.07	3,558.59	660.46	63.43	213.29	-	1.35	2.90	86.38	1.69
3.24 - Oregon	3,911.31	1,655.24	5,566.55	886.55	37.00	871.50	-	3.70	35.16	66.70	12.53
3.25 - California	6,079.31	3,354.26	9,433.57	2,822.52	73.05	107.24	73.39	8.04	4.71	201.62	61.71
3.4 Cooperative Ribes eradication											
3.42-1 - Clearwater Timber Protective Association	5,602.84	1,873.74	7,476.58	1,145.97	11.94	31.71	130.34	-	229.61	150.41	73.76
3.42-2 - Follath Timber Protective Association	5,696.22	2,373.63	8,069.85	1,275.22	4.00	-	238.66	-	595.63	146.99	183.13
4.1 Spread of the rust											
4.11 - Montana	467.33	258.04	725.37	103.20	10.50	142.45	-	9.24	-	60	1.95
4.13 - Idaho	187.50	127.00	314.50	74.65	19.36	19.36	7.28	.97	-	-	-
4.15 - Washington	197.55	42.71	240.26	31.35	-	-	-	-	-	-	-
4.14 - Oregon	1,204.36	902.57	2,106.93	528.90	75.30	255.65	-	20.64	3.00	4.28	10.80
4.15 - California	458.06	326.55	784.61	123.44	33.47	164.64	-	3.74	36	-	50
4.2 Damage to pine	4,145.22	1,565.65	5,710.87	870.88	123.26	511.21	16.73	20.19	-	12.18	11.20
5. Educational work	2,509.99	1,041.23	3,551.22	192.34	166.02	255.85	12.33	11.45	-	140.42	242.62
9. Maintenance of field office and miscellaneous expense											
9.1 - Supervision	2,239.98	513.06	2,813.04	121.35	367.71	-	-	23.60	-	-	.40
9.2 - Office maintenance	5,699.36	2,158.07	7,857.43	207.20	199.37	-	-	3.65	-	-	1,751.65
9.3 - Miscellaneous supplies and services paid on I/A	-	354.67	354.67	-	-	9.87	2.25	-	38.32	230.60	73.63
9.4 - Miscellaneous supplies paid in Washington	-	953.95	953.95	-	-	-	-	-	17.00	936.95	-
Total	\$70,950.41	\$31,870.96	\$102,821.37	\$15,231.63	\$2,036.76	\$3,115.70	\$862.09	\$183.21	\$*1,281.39	\$3,446.31	\$3,231.68

\*See also separate summary of expenditures from Association funds for these projects.

\*\*Includes operation of U.S.C. truck for projects 2.22-2, 2.22-3, 2.3-2 and 3.42-2.

Outstanding freight and express charges for various projects estimated at \$575.00 not included.

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# Cooperative Expenditures.

The following table summarizes the expenditure of cooperative funds on Ribes eradication by the Potlatch and Clearwater Timber Protective Associations.

The association funds were deposited as a special account in the U. S. Treasury and disbursed by the Western Office of Blister-Rust Control.

TABLE NO. 3.

## SUMMARY OF BLISTER-RUST CONTROL COOPERATIVE RIBES ERADICATION EXPENDITURES By the CLEARWATER AND POTLATCH TIMBER PROTECTIVE ASSOCIATIONS June 10, 1929 - October 20, 1929.

Cooperating Agency	Salary	Expense	Total	Subsistence Supplies	Miscellaneous Supplies and Ser- vices
June 10-30, 1929.					
Clearwater Timber Protective Association	\$ 895.77	\$ 744.49	\$ 1,640.26	\$ 641.74	\$ 102.75
Potlatch Timber Protective Association	930.13	615.65	1,545.78	547.49	68.16
Total June 10-30	\$ 1,825.90	\$ 1,360.14	\$ 3,186.04	\$ 1,189.23	\$ 170.91
July 1 - October 20, 1929.					
Clearwater Timber Protective Association	\$ 6,076.87	\$ 1,554.56	\$ 7,631.43	\$ 1,358.46	\$ 196.10
Potlatch Timber Protective Association	6,261.56	1,948.63	8,210.19	1,914.42	34.21
Total July 1-October 30	\$12,338.43	\$3,503.19	\$15,841.62	\$3,272.88	\$ 230.31
GRAND TOTAL	\$14,164.33	\$4,863.33	\$19,027.66	\$4,462.11	\$ 401.22

	<u>Allotment</u>	<u>Expended</u>	<u>Balance</u>
Clearwater Timber Protective Association.....	\$10,000.00	\$9,271.69	\$728.31
Potlatch Timber Protective Association.....	10,000.00	9,755.97	244.03
Total.....	\$20,000.00	\$19,027.66	\$972.34

For Federal expenditures on these projects see projects 3.42-1 and 3.42-2 on statements of Western Federal Blister-Rust Control expenditures, January 1, 1929 - June 30, 1929, and July 1, 1929 - December 31, 1929.



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The following table summarizes the results of the study. The data are presented in the following table:

## ACKNOWLEDGMENTS



## GENERAL SUMMARY

### I. Delaying Spread of the Rust.

#### A. Cultivated Black Currant Eradication.

California - 160 bushes eradicated from 22 plantings in 4 counties; 6 bushes from 3 plantings in reworking one county. Work completed in 52  $\frac{3}{4}$  of the 58 counties.

### II. Development of Local Control Practice.

#### A. Field Study of Methods of Chemical Eradication.

Morro Creek, California - Experimental work carried on during January and February, 1929 for further development of methods and equipment used in both knapsack and power spraying. Results were of direct value in providing efficient equipment, in training permanent personnel and in deciding to use knapsack spraying on major application projects with further experimental work with power spraying.

#### B. Re-eradication.

##### 1. Idaho.

a. Hand - On the Coeur d'Alene National Forest 4,699.8 acres were re-eradicated at a cost of \$.59 on area worked in 1926 at a cost of \$2.41 per acre 43.9 Ribes (92% seedlings) and 46 feet of live stem per acre were pulled in 1929; 186.3 bushes and 2,794 feet of live stem per acre in 1926. Amount of live stem left was so small that re-eradication could be delayed four or five years after first eradication.

b. Chemical. On the East Fork of Potlatch Creek 336.5 acres were worked, 219.3 acres of which was a re-eradication of the area sprayed in 1928. It was found that seedlings come in the first year after eradication in great numbers; 58 per cent of Ribes found were seedlings, 27 per cent surviving bushes and 15 per cent sprouts. A 20 per cent solution of sodium chlorate proved to be the most effective spray used in 1928.

2. Washington - Wind River Nursery - Work was confined to stream type where Ribes were heavily concentrated in 1928. 345 Ribes and 6,058 feet of live stem were removed from an area which yielded 5,747 bushes and 40,778 feet of live stem in 1928.

3. California - Three 15-acre Forest Service plots studied to check Ribes regeneration 3 years after original eradication and to study effect of different methods of logging on Ribes establishment. 30 Ribes per acre eradicated in 1926; in 1929, 7.98 bushes (3.54 missed bushes,



I. Delaying Spread of the Rust.

A. Cultivated Black Currant eradication.

California - 160 bushes eradicated from 25 plantings in counties; 8 bushes from 3 plantings in Kern County. The rust is present in 23 3/4 of the 28 counties.

II. Development of Local Control Practice.

A. Field Study of Methods of Local Eradication.

Morro Creek, California - A permanent field station was established in January and February, 1932, for the study of methods of local control of the rust. The station was established in both riparian and power riparian areas. The station was established in providing field equipment, in training permanent personnel and in deciding to use Knapweed spraying on major application projects with further experimental work with power spraying.

B. Re-eradication.

1. Idaho.

a. Hand - On the Green Mountain National Forest 4,889.8 acres were re-eradicated at a cost of \$38 on areas worked in 1931 at a cost of \$2.41 per acre (47.9 Ribes (43.2 seedlings) and 46 feet of live stem per acre were killed in 1932; 188.3 bushes and 2,704 feet of live stem per acre in 1933. Amount of live stem left was so small that re-eradication could be delayed four or five years after first eradication.

b. Spraying - On the West Fork of Lost Lake Creek 588.5 acres were worked, 218.3 acres of which was a re-eradication of the rust. It was found that seedlings were in the first year after eradication in great numbers; 32 per cent of Ribes found were seedlings, 27 per cent surviving bushes and 15 per cent sprouts. A 10 per cent solution of sodium cyanate proved to be the most effective spray used in 1931.

2. Washington - King River, primarily - Work was confined to the type where Ribes were heavily concentrated in 1932. 348 Ribes and 2,704 feet of live stem were removed from an area which yielded 2,704 Ribes and 40,778 feet of live stem in 1933.

3. California - Three riparian forest service plots situated on the Green Mountain National Forest 5 years after original eradication and to study effect of different methods of logging on Ribes establishment. The plots were eradicated in 1929; in 1932, 7.22 bushes and 1,704 Ribes were removed.



3.49 sprouts and .85 seedlings) per acre and 33.24 feet of live stem per acre were eradicated.

### C. Development and Testing of Ribicides.

#### 1. Chemical Investigation.

##### a. Results of Tests of Ribicides in 1928.

Idaho - Alkaline chlorate sprays showed best results on R. inerme. Sprays most effective on R. inerme also most effective on R. lacustre. R. viscosissimum susceptible to a 15 per cent chlorate solution at pH of 6.8.

Oregon - Chlorate sprays of less than 15 per cent relatively ineffective on R. bracteosum. A complete kill obtained on R. lacustre.

California - R. roezli resistant to a large range of spray formulae. R. nevadense susceptible to a mixture of sodium chlorate and furfural. Sodium chlorate alone is more effective on both R. roezli and R. nevadense than mixtures of sodium chlorate with calcium chloride or with ammonium chloride in acid and alkaline solutions.

b. Tests of Ribicides, 1929. Field tests were carried on with variations of chlorate solutions and complex salts of heavy metals, specific formulae resulting from enlarged program of investigative work in the laboratory. In Idaho, 40 spray solutions were tested on R. inerme and R. lacustre; in Oregon, 26 different solutions were sprayed on R. bracteosum, R. sanguineum and R. triste and in California, 27 formulae were tested on R. roezli, R. nevadense and R. cereum. While definite data on the effect of these sprays cannot be procured until 1930, late season observations indicate that complex X is more effective than complex Y on Ribes in all three states.

c. Laboratory Investigations. A comprehensive investigative program has been continued at Berkeley, California to solve pertinent problems of a chemical, physiological and morphological nature.

#### 2. Experimental Application of Ribicides.

41 solutions were sprayed on 141 plots at Clarkia, Idaho to test the effectiveness of various sprays, to test the relationship between time of application during day and effectiveness of sprays and to determine seasonal effect on toxicity of chemicals, definite results to be determined in 1930.

### D. Studies in Ribes Ecology.

#### 1. Inland Empire - Additional findings of this project are:



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...with the fact the involvement of

• Исторический очерк •

- 1981 -

SECRET - GROUP 1  
Excluded from automatic downgrading and  
declassification

Gray formiae. H. novaeformis resembles H. novaeformis in coloration and habitus. It is more effective on both sides. The coloration of the body is similar to that of H. novaeformis.

3. Tests of individual fish. While tests were carried out on individual fish, the following observations were made:

proteins of the cytoplasm, mitochondria, and nucleus.

8. Is there any other information?

...the ... ..  
... ..  
... ..  
... ..

2. Studies in Ribes color.

1970-1971, 1972-1973, 1974-1975, 1976-1977, 1978-1979, 1980-1981, 1982-1983, 1984-1985, 1986-1987, 1988-1989, 1990-1991, 1992-1993, 1994-1995, 1996-1997, 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013, 2014-2015, 2016-2017, 2018-2019, 2020-2021, 2022-2023, 2024-2025, 2026-2027, 2028-2029, 2030-2031, 2032-2033, 2034-2035, 2036-2037, 2038-2039, 2040-2041, 2042-2043, 2044-2045, 2046-2047, 2048-2049, 2050-2051, 2052-2053, 2054-2055, 2056-2057, 2058-2059, 2060-2061, 2062-2063, 2064-2065, 2066-2067, 2068-2069, 2070-2071, 2072-2073, 2074-2075, 2076-2077, 2078-2079, 2080-2081, 2082-2083, 2084-2085, 2086-2087, 2088-2089, 2090-2091, 2092-2093, 2094-2095, 2096-2097, 2098-2099, 2100-2101, 2102-2103, 2104-2105, 2106-2107, 2108-2109, 2110-2111, 2112-2113, 2114-2115, 2116-2117, 2118-2119, 2120-2121, 2122-2123, 2124-2125, 2126-2127, 2128-2129, 2130-2131, 2132-2133, 2134-2135, 2136-2137, 2138-2139, 2140-2141, 2142-2143, 2144-2145, 2146-2147, 2148-2149, 2150-2151, 2152-2153, 2154-2155, 2156-2157, 2158-2159, 2160-2161, 2162-2163, 2164-2165, 2166-2167, 2168-2169, 2170-2171, 2172-2173, 2174-2175, 2176-2177, 2178-2179, 2180-2181, 2182-2183, 2184-2185, 2186-2187, 2188-2189, 2190-2191, 2192-2193, 2194-2195, 2196-2197, 2198-2199, 2200-2201, 2202-2203, 2204-2205, 2206-2207, 2208-2209, 2210-2211, 2212-2213, 2214-2215, 2216-2217, 2218-2219, 2220-2221, 2222-2223, 2224-2225, 2226-2227, 2228-2229, 2230-2231, 2232-2233, 2234-2235, 2236-2237, 2238-2239, 2240-2241, 2242-2243, 2244-2245, 2246-2247, 2248-2249, 2250-2251, 2252-2253, 2254-2255, 2256-2257, 2258-2259, 2260-2261, 2262-2263, 2264-2265, 2266-2267, 2268-2269, 2270-2271, 2272-2273, 2274-2275, 2276-2277, 2278-2279, 2280-2281, 2282-2283, 2284-2285, 2286-2287, 2288-2289, 2290-2291, 2292-2293, 2294-2295, 2296-2297, 2298-2299, 2300-2301, 2302-2303, 2304-2305, 2306-2307, 2308-2309, 2310-2311, 2312-2313, 2314-2315, 2316-2317, 2318-2319, 2320-2321, 2322-2323, 2324-2325, 2326-2327, 2328-2329, 2330-2331, 2332-2333, 2334-2335, 2336-2337, 2338-2339, 2340-2341, 2342-2343, 2344-2345, 2346-2347, 2348-2349, 2350-2351, 2352-2353, 2354-2355, 2356-2357, 2358-2359, 2360-2361, 2362-2363, 2364-2365, 2366-2367, 2368-2369, 2370-2371, 2372-2373, 2374-2375, 2376-2377, 2378-2379, 2380-2381, 2382-2383, 2384-2385, 2386-2387, 2388-2389, 2390-2391, 2392-2393, 2394-2395, 2396-2397, 2398-2399, 2400-2401, 2402-2403, 2404-2405, 2406-2407, 2408-2409, 2410-2411, 2412-2413, 2414-2415, 2416-2417, 2418-2419, 2420-2421, 2422-2423, 2424-2425, 2426-2427, 2428-2429, 2430-2431, 2432-2433, 2434-2435, 2436-2437, 2438-2439, 2440-2441, 2442-2443, 2444-2445, 2446-2447, 2448-2449, 2450-2451, 2452-2453, 2454-2455, 2456-2457, 2458-2459, 2460-2461, 2462-2463, 2464-2465, 2466-2467, 2468-2469, 2470-2471, 2472-2473, 2474-2475, 2476-2477, 2478-2479, 2480-2481, 2482-2483, 2484-2485, 2486-2487, 2488-2489, 2490-2491, 2492-2493, 2494-2495, 2496-2497, 2498-2499, 2500-2501, 2502-2503, 2504-2505, 2506-2507, 2508-2509, 2510-2511, 2512-2513, 2514-2515, 2516-2517, 2518-2519, 2520-2521, 2522-2523, 2524-2525, 2526-2527, 2528-2529, 2530-2531, 2532-2533, 2534-2535, 2536-2537, 2538-2539, 2540-2541, 2542-2543, 2544-2545, 2546-2547, 2548-2549, 2550-2551, 2552-2553, 2554-2555, 2556-2557, 2558-2559, 2560-2561, 2562-2563, 2564-2565, 2566-2567, 2568-2569, 2570-2571, 2572-2573, 2574-2575, 2576-2577, 2578-2579, 2580-2581, 2582-2583, 2584-2585, 2586-2587, 2588-2589, 2590-2591, 2592-2593, 2594-2595, 2596-2597, 2598-2599, 2600-2601, 2602-2603, 2604-2605, 2606-2607, 2608-2609, 2610-2611, 2612-2613, 2614-2615, 2616-2617, 2618-2619, 2620-2621, 2622-2623, 2624-2625, 2626-2627, 2628-2629, 2630-2631, 2632-2633, 2634-2635, 2636-2637, 2638-2639, 2640-2641, 2642-2643, 2644-2645, 2646-2647, 2648-2649, 2650-2651, 2652-2653, 2654-2655, 2656-2657, 2658-2659, 2660-2661, 2662-2663, 2664-2665, 2666-2667, 2668-2669, 2670-2671, 2672-2673, 2674-2675, 2676-2677, 2678-2679, 2680-2681, 2682-2683, 2684-2685, 2686-2687, 2688-2689, 2690-2691, 2692-2693, 2694-2695, 2696-2697, 2698-2699, 2700-2701, 2702-2703, 2704-2705, 2706-2707, 2708-2709, 2710-2711, 2712-2713, 27



On burned plots *Ribes* germination is almost complete the first year; on unburned plots there is heavy germination the second year as well. There is some germination during each growing season. 50 to 60 per cent of *Ribes* die out in 3 initial seasons of growth with 2/3 of casualties during first growing season.

*Ribes* begin fruiting at more advanced age than previous data indicated; a bush fruiting in its third year and a stand fruiting generally in its fifth year are exceptional.

Removal of timber canopy is the only one of the three changes in controlled studies which causes a permanent establishment of *Ribes*.

In a mature white-pine stand, removal of canopy caused an increase in soil temperature of 10 degrees C. on east slope, 14 degrees C. on west slope; removal of top duff - further increase of 30 degrees C. on east, 20 degrees C. on west slope; removal of basal duff - further increase of 5 degrees C. on east, 10 degrees C. on west slope; light burn on undisturbed duff after removal of canopy - increase of 55 degrees C. on east, 40 degrees C. on west slope. Maximum temperatures from 25 degrees C. to 55 degrees C. reached following clear-cut logging, 16 degrees C. to 45 degrees C. on partial-cutting areas. Sustained temperatures exceeding 25 degrees C. are unusual in partial-cutting areas except in most open parts.

2. California. A number of plot studies were initiated which require further checking before definite conclusions can be drawn. Findings in 1929 are: (1) brush-pile burns do not have any marked effect on a *Ribes* stand; (2) after logging there is a period of 1 or 2 years before heavy germination takes place, then maximum germination continues for 2 to 3 years after which there is a rapid decline; (3) data on hand at present indicate that there is no large storage of seed in the soil over a long period; (4) soil disturbance is a factor in *Ribes* germination only when other conditions are favorable.

3. Oregon. (1) *R. klamathense* requires a moist habitat for seedlings to become established; (2) ecesis of some species, *R. cruentum* and *R. lobbi* seems to have taken place during certain favorable seasons rather than each year.

### III. Application of Local Control.

#### A. Control Reconnaissance.

California - The preliminary survey of the sugar-pine forests was initiated on the Lassen National Forest where reconnaissance was done on 117,927 acres at a cost of \$.0289 per acre.



On burned plots Ribes germination is almost constant the first year; on unburned plots there is heavy germination the second year as well. There is some germination during the third year. 60 per cent of Ribes die out in 3 initial seasons of growth of casualties during first growing season.

Ribes begin fruiting at more advanced age than previous data indicated; a bush fruiting in its third year and a stem fruiting generally in its fifth year are exceptional.

Removal of timber canopy is the only one of the factors changes in controlled studies which causes a permanent establishment of Ribes.

In a mature white-pine stand, removal of canopy causes an increase in soil temperature of 10 degrees C. on east slope, 14 degrees C. on west slope; removal of top drift - further increase of 14 degrees C. on east, 30 degrees C. on west slope; removal of drift - further increase of 14 degrees C. on east, 10 degrees C. on west slope; light burn on undisturbed soil after removal of canopy - increase of 55 degrees C. on east, 4 degrees C. on west slope. Maximum temperatures from 35 degrees C. to 55 degrees C. between 10 and 14 feet-out logging, 18 degrees C. to 45 degrees C. on drift-out logging. Sustained temperatures exceeding 35 degrees C. are unusual in the mountain in most open parts.

2. California. A number of plot studies were initiated with require further research before definite conclusions can be drawn. Findings in 1929 are: (1) brush-pile burns do not have any marked effect on a Ribes stand; (2) after logging there is a period of 1 or 2 years before heavy germination takes place, then maximum germination for 2 to 3 years after which there is a rapid decline; (3) data on soil at present indicate that there is no large surplus of seed in the soil over a long period; (4) soil disturbance is a factor in Ribes germination only when other conditions are favorable.

3. Oregon. (1) P. Klamathensis requires a moist habitat for seedlings to become established; (2) seeds of some species, P. cuneata and P. lobbii seems to have taken place during certain favorable seasons rather than each year.

## III. Application of Local Control.

### A. Control Recommendations.

California - The preliminary survey of the white-pine forests was initiated on the Lassen National Forest where reconnaissance was made on 117,927 acres at a cost of \$4,0289 per acre.



## B. Ribes Eradication on Federal Lands.

Power Spraying - Clearwater National Forest. Development of power spraying indicates that this type of work may be carried on efficiently and economically on areas with heavy concentrations of Ribes. 742 acres of stream type were worked at a cost of \$12.85 per acre. 11,150 acres of white-pine type were protected at an average cost of \$.89 per acre for protection.

## C. Ribes Eradication - Sevenac Nursery.

At a cost of \$13.675 per acre work was completed on 244.4 acres of stream type including 40 acres on St. Regis River which were cleared by fire.

## D. Ribes Eradication in California.

On the Plumas National Forest 472,406 Ribes, 129.1 per acre, were eradicated from 3,660.6 acres at a cost of \$3.49 per acre.

## E. Ribes Eradication in Oregon.

1. Still Creek - 6,903 Ribes pulled from 454.4 acres; 1,674 bushes eradicated with chemicals from 5.6 acres. A total of 460 acres worked for protection of Forest Service planting.

2. Peavy Arboretum - Protected by eradication of 1,661 Ribes from 396 acres.

## F. Cooperative Ribes Eradication.

1. Clearwater Timber Protective Association - Ribes eradicated from 1,835.6 acres of stream type at cost of \$12.22 per acre. A high degree of protection provided to 21,500 acres of white pine at an average cost of \$1.04 per acre.

2. Potlatch Timber Protective Association - Stream type Ribes eradicated from 3,099.4 acres at a cost of \$6.65 per acre affording protection to 57,010 acres of white pine at an average cost of \$0.36 per acre for the high degree of protection provided by stream-type eradication.

## G. Administrative Inspection.

Efficiency of work on Clearwater Timber Protective Association lands was found to average 98.3 per cent; on the Potlatch Timber Protective Association lands 99.2 per cent based on live stem killed. At Sevenac Nursery 3,744 feet of live stem per acre were left after 1928 eradication; 888 feet of live stem per acre after eradication in 1928 and 1929. On an area on the Kaniksu National Forest eradicated in 1926, re-eradicated in 1928, checkers found that in stream type 1,671 feet of live stem per acre



B. Ribes eradication on Federal Lands.

Power spraying - Clearwater National Forest. Investigation of power spraying indicates that this type of work may be carried on efficiently and economically on areas with heavy concentrations of Ribes. 748 acres of stream type were worked at a cost of \$12.36 per acre. 11,180 acres of white-pine type were protected at an average cost of per acre for protection.

C. Ribes eradication - Keweenaw Nursery.

At a cost of \$12.678 per acre work was completed on 247.4 acres of stream type including 40 acres on St. Regis River which were disposed fire.

D. Ribes eradication in California.

On the Plumas National Forest 472,400 Ribes, 1881 per acre, were eradicated from 2,680.6 acres at a cost of \$3.44 per acre.

E. Ribes eradication in Oregon.

1. Still Creek - 2,902 Ribes pulled from 434.4 acres; 1,874 D eradicated with chemicals from 8.6 acres. A total of 443 acres worked for protection of Forest Service plantings.

2. Heavy Mountain - Protected by eradication of 1,631 Ribes from 398 acres.

F. Cooperative Ribes eradication.

1. Clearwater Timber Protective Association - Ribes eradicated from 1,838.8 acres of stream type at cost of \$12.36 per acre. A high degree of protection provided to 21,500 acres of white pine at an average cost of \$1.04 per acre.

2. Potlatch Timber Protective Association - Stream type Ribes eradicated from 2,036.4 acres at a cost of \$3.66 per acre including no tion to 27,010 acres of white pine at an average cost of \$1.36 per acre for the high degree of protection provided by stream-type eradication.

G. Administrative inspection.

Efficiency of work on Clearwater Timber Protective Association lands was found to average 94.3 per cent; on the Potlatch Timber Protective Association lands 92.8 per cent based on live stem killed. At Keweenaw Nursery 3,744 feet of live stem were left after 1935 eradication. 888 feet of live stem per acre after eradication in 1935 and 1937. On areas on the Kenai National Forest eradicated in 1935, re-eradicated in 1936, checkers found that in stream type 1,671 feet of live stem per acre



were left after first eradication and 208 feet per acre after second eradication; in upland types 20 feet of live stem per acre were left after first eradication and nothing left after re-eradication.

#### IV. Field Studies and Collection of Field Data.

##### A. Spread of the Rust.

1. New Pine Infections - Idaho - Clearwater County, 3 centers - one at junction of Elk and Deep Creeks and one at junction of Three Bear and Long Meadow Creeks, both in the vicinity of Elk River and one on North Fork of Reed's Creek near Headquarters; Shoshone County, on Middle Fork of St. Maries River near Clarkia. Oregon - Hood River County on Eagle Creek and on Herman Creek; Wasco County on Beaver Creek and Clackamas County on Salmon River.

2. New Ribes Infections - Montana - Mineral County, 9 miles north-east of Haugan. Oregon - Jefferson County on Metolius River, Marion County on Devils Creek near Breitenbush and Curry County near Port Orford.

##### B. Effectiveness of Control - Plot Studies.

Newman Lake, Idaho - Rate of increase in number of cankers of 1927 wave over 1923 wave of infection was in ratio of 1.2 to 1; infection chargeable to 3,155 feet of live stem of R. inerme and 2,118 feet of live stem of R. lacustre per acre. R. inerme eradicated in 1929 to study effect of R. lacustre in intensification of disease.

Long Meadow Creek, Idaho - 27 feet of live stem of R. viscosissimum and 1,851 feet of live stem of R. lacustre per acre have resulted in infection of 5 per cent of pines since 1923.

Rhododendron, Oregon - 13.5 per cent of pines infected since disease became established in 1923, as result of association with 1,071 feet of Ribes live stem per acre (R. bracteosum - 419 feet, R. sanguineum - 125 feet and R. lacustre - 527 feet).

##### C. Pre-eradication.

1. Idaho - A pre-eradication survey was made on the stream type of 127,000 acres of white-pine type on Federal and private lands as follows: Clearwater National Forest, 35,000 acres; Clearwater Timber Protective Association 32,000 acres and Potlatch Timber Protective Association 60,000 acres.

2. California - In preparation for the 1930 field season pre-eradication work was done on 3,200 acres in the Rush Creek area of the Plumas National Forest.

##### V. Educational Work.

Through the media of talks and papers, demonstration material and specimen mounts information on the work of all projects has been disseminated to administrators of forest land, educational institutions and the general public in order to build up general interest in and support of the control program.



























